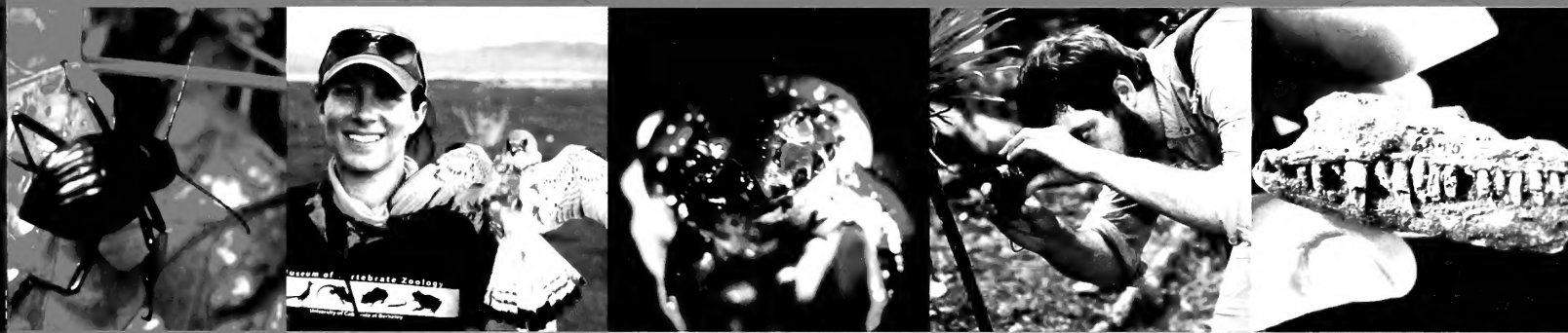




MUSEUM OF COMPARATIVE
ZOOLOGY
ANNUAL REPORT
HARVARD UNIVERSITY



2011-2012



DIRECTOR'S MESSAGE

Those of us who work in natural history museums confront a significant paradox.

On the one hand, there arguably has never been a better time to be a comparative and evolutionary biologist. The rate of discovery of new, unnamed species is higher than ever before. We have at our disposal an array of cutting-edge tools and technologies that may yield answers to fundamental questions about evolutionary patterns and underlying mechanisms that the scientific community has pondered for decades, if not centuries. Yet, threats to Earth's biodiversity are increasing every day. These threats, if unchecked, will lead to a global loss of species in our lifetimes that may rival the global mass extinctions of prehistoric times. This paradox contributes to a heightened sense of urgency that underlies all we do. At the very least, these are exciting times.

The MCZ remains relevant by maintaining research programs of broad intellectual scope, which focus on contemporary scientific and societal problems. It continues to train generations of comparative and evolutionary biologists of all stripes and to instill an understanding and appreciation of the natural world in countless undergraduates. It is thus with enormous pleasure that I present this latest annual report, which highlights the research, education and related initiatives conducted by MCZ faculty, staff, students and visitors during the 2011–2012 academic year.

The opening pages of this report chronicle what often prove to be life-changing experiences for Harvard undergraduates and graduate students. Several Organismic and Evolutionary Biology (OEB) department courses led by MCZ faculty-curators offer enrolled students all-expense-paid field trips to the tropics during spring break.

The university underwrites the entire cost of these trips, largely from MCZ discretionary funds but with key additional support from OEB, the David Rockefeller Center for Latin American Studies and other sources within the Faculty of Arts and Sciences. These unforgettable experiences convince many students to choose the OEB concentration, some to go to graduate school in comparative biology and others to become committed environmentalists, but everyone benefits in important ways.

Recent activity in MCZ's collections has furthered our multiyear effort to improve environmental conditions for specimen conservation, increase storage capacity and enhance access. As I write this message, most of the mammal collection is being rehoused in our state-of-the-art facility in the Northwest Building. Another example is our new Cryogenic Collection in MCZ Laboratories, which will provide a common, shared facility for maintaining frozen samples for genetic analysis. Finally, ongoing initiatives in biodiversity informatics are generating additional means of sharing collections data worldwide.

MCZ's strength as a research and teaching institution lies not only in its strong intellectual foundation and its excellent facilities, but also in the largely unheralded efforts of its many faculty-curators, staff and students, who together push the frontiers of scientific learning and discovery. Hence, I commend and thank everyone once again for the work they do to make the MCZ the essential and relevant institution that it is today.

James Hanken
Director



Cover photo credits:

Top, left to right: Gonzalo Giribet; Gonzalo Giribet; Adam Baldinger; Gonzalo Giribet; Rowan Barrett

Bottom, left to right: Breeanna Elliott; Scott Edwards; Thomas Dai; Jay Taft; Jessica Hawthorn

Opposite page: Peter Wilton



STUDENTS EXPERIENCE TROPICAL BIODIVERSITY FIRSTHAND

Whether netting birds in Panama, searching out reptiles in Costa Rica or diving for sea stars, the 2012 spring break took students into the field to experience what they could never learn through textbooks and museum specimens alone.

Three classes from the Organismic and Evolutionary Biology department—taught largely by MCZ faculty-curators—offered all-expense-paid trips for their undergraduate and graduate students. For some, it was their first journey out of the country. For most, it was their initial exposure to the diverse environments of the Neotropical region—rainforest, cloudforest, savannah, coastal wetlands—or distinctive marine habitats like mangrove forests and coral reefs.

Even though specimens from the MCZ collections are studied in classroom settings, observing a live animal's behavior in its natural habitat is an entirely different experience. Seeing species alive and up close facilitates the learning process, bringing scientific terms and phylogenetic groups figuratively and literally to life.

Experiences in the field also engender a deeper understanding of—and sense of awe for—these rapidly disappearing ecosystems. The spring field trips will convince some students to choose an OEB concentration, attend graduate school in some area of comparative biology, or become committed environmentalists. Regardless of their future career paths, these trips imbue students with respect for the planet's biodiversity and ignite their conservation ethic.

Observing Amphibians and Reptiles in Costa Rica

OEB 167: Herpetology took 21 students to Costa Rica's La Selva Biological Station, operated by the Organization of Tropical Studies; Veragua Rainforest Station, an ecotourist educational facility; and Pacuare Nature Reserve on the northeastern coast

of Costa Rica. Professors **James Hanken** and **Jonathan B. Losos** led the trip, assisted by teaching fellow **Alexis Harrison** and Losos lab members **Martha Muñoz**, **Ambika Kamath** and **Katie Boronow**.



Connie Lee

Before departing for Costa Rica, Professors Hanken and Losos charged their students with the task of becoming “resident experts” in specific reptile and amphibian species. On daily hikes, students shared information about their organisms once they were encountered in the field. Sightings of crocodiles, caiman and sea turtles were especially prized, but so were rare species of frogs, snakes and lizards such as *Corytophanes*, a hard-to-find arboreal lizard.

“The herpetological diversity of Costa Rica is astonishing, and even in a week, we were able to see an enormous variety of reptiles and amphibians,” says Prof. Losos. “Students had varying opinions about what constituted the highlight, but the nesting sea turtles seem to have made a deep impression on many, and most loved the arboreal herpetological prospecting by zipline.”

Birding in Panama

This experience introduced 12 students of *OEB 190: Biology and Diversity of Birds* to the



Amanda Lu



Gonzalo Gribet



Thomas Dai

rich diversity of Neotropical birds, improved their abilities to locate and identify birds in the field and exposed them to a new array of habitats and a different culture. Professor **Scott V. Edwards** was assisted by two teaching fellows—**Dr. Frank Rheindt** and **Maude Baldwin**—and Euclides Campos, a Panamanian expert bird guide. Rheindt and Campos showed the group an incredible number of species—more than 200—over the course of the trip.

Days typically began with the pre-sunrise “dawn chorus” when bird activity is highest. Students continued birding throughout the day, experiencing the Canal Zone rainforest, mid- and high-elevation cloudforest, savannah and coastal wetlands. During periods of lower bird activity, the class toured research facilities; observed and assisted in mist-netting, the primary method of catching birds in ornithological research; and visited nearby towns. Species sighted included the spectacular Resplendent Quetzal, a large bird with a metallic green back and extremely long tail streamers; antbirds; toucans; hummingbirds; and the Three-wattled Bellbird. The students were treated to a rare occurrence in field research when they were able to observe the Bellbirds courting and mating in the wild.

“Witnessing the diversity of the Neotropics is an eye-opening experience for many biologists,” says Maude Baldwin. “Viewing the region’s diversity through the lens of its avifauna, under the guidance of some of the most knowledgeable people in the world on Panamanian birds, was an incredible experience for the students and teaching staff alike.”

Collecting Invertebrates in Panama

The goal for *OEB 51: Biology and Evolution of Invertebrate Animals* was to show the 14 students the sheer abundance and diversity of invertebrate animals in the wild and how these animals function and behave in their natural settings. Professor **Gonzalo Giribet** and Associate Professor Cassandra G. Extavour led the trip, assisted by two teaching

fellows, Ben Ewen-Campen and **Gisele Kawauchi**.

Each day, the group traveled by boat to a variety of habitats that included coral reefs, mangroves, muddy sediment, sandy-bottom habitats and rock walls. Students, equipped with full-body wetsuits and snorkels, experienced a dizzying array of animal life in marine habitats covered in live sponges, corals, brittle stars, sea urchins and other species too numerous to mention.

Students were initially introduced to the most abundant and charismatic of the marine invertebrates—enormous sea stars, brightly colored sea anemones and coral reef species—and then tried to identify as many organisms as possible from different invertebrate phyla, including the small and the difficult-to-classify. During the week they spent hours collecting live animals to examine at the well-equipped laboratory facilities at the Smithsonian Tropical Research Institute in Bocas del Toro. Students especially liked the incredible out-of-this-world plankton creatures, consisting largely of larval forms of many animals that look nothing like the final forms of the adults.

“Observing invertebrate phyla in their natural habitat revealed behavior, distribution and beauty in a way that a fact sheet never could,” says **Inanna Carter**, Class of 2014. “Being out in the field gave us passion and energy for dissecting specimens in the lab and learning about them in the classroom. Our enthusiasm followed us back to Harvard, and even spread to my other classes and experience of Harvard as a whole.”



Gonzalo Giribet



Gonzalo Giribet



Glenn Clifton



MCZ FACULTY-CURATORS



Andrew A. Biewener

*Charles P. Lyman Professor of Biology
Director, Concord Field Station*

Prof. Biewener's research focuses on understanding the biomechanics, neuromuscular control and energetics of animal movement on land and in the air. His goal is to understand general principles that govern the biomechanical and physiological design of vertebrate animals related to their movement in natural environments.



Scott V. Edwards

*Professor of Organismic
and Evolutionary Biology
Alexander Agassiz
Professor of Zoology
Curator of Ornithology*

Prof. Edwards' research focuses on the evolutionary biology of birds and relatives, combining field, museum and genomics approaches to understand the basis of avian diversity, evolution and behavior.

The guiding principles of his lab's research include population genetics, systematics and field observations of diversity and behavior. His research emphasizes applying the methods of genomics to understand the history of populations, species and larger evolutionary groups of birds. In recent years several members of his lab have conducted genomic studies of reptiles to find clues to what the ancestral avian genome may have looked like. A major ongoing project focuses on the evolutionary consequences of a new host-pathogen association brought about in 1994, when a bacterial pathogen, *Mycoplasma gallisepticum*, switched avian hosts from poultry to House Finches, a common North American songbird. Edwards has also helped develop new analytical approaches to estimating phylogenetic trees, an important exploratory tool and framework for hypothesis testing in evolutionary biology.

Prof. Edwards has conducted fieldwork throughout Australia and North America and has worked extensively in seabird colonies in Hawaii and Nova Scotia. He strives to create a new cadre of scientists who are comfortable both in the field as well as using cutting-edge genomic technologies that are transforming evolutionary biology.

Edwards is actively engaged in several efforts to enhance the diversity of the scientific workforce, both in and outside of Harvard.



Brian D. Farrell

*Professor of Biology
Curator of Entomology*

Prof. Farrell's research is broadly concerned with whether the diversity of species on Earth is a cause or consequence of the diverse roles different species play in ecosystems, particularly interactions between insects and plants.

The Farrell lab serves as a base for the Beetle Tree of Life project, a collaborative and comprehensive phylogenetic study of this most diverse group of animals.

**Gonzalo Giribet**

*Professor of Organismic and Evolutionary Biology
Curator of Invertebrate Zoology*

Prof. Giribet's primary research focuses on the evolution, systematics and biogeography of invertebrate animals. Current projects in the Giribet lab include multidisciplinary studies for Assembling the Bivalve Tree of Life, the diversity of Neotropical arachnids, and systematics and

biogeography of arthropods, mollusks, sponges, sipunculans, platyhelminthes and onychophorans. He is also interested in philosophical aspects of DNA sequence data analysis, emphasizing homology-related issues.

**Hopi E. Hoekstra**

*Professor of Organismic and Evolutionary Biology
Alexander Agassiz Professor of Zoology
Curator of Mammalogy*

Prof. Hoekstra combines field and laboratory

work to understand the evolution of mammalian diversity from morphology to behavior. Her research focuses on the genetic basis of adaptive variation—identifying both the ultimate causes and the proximate mechanisms responsible for traits that help organisms survive and reproduce in the wild. Research in the Hoekstra lab integrates ecological, behavioral, genetic and molecular approaches.

**James Hanken**

*Professor of Biology
Alexander Agassiz Professor of Zoology
Curator of Herpetology
MCZ Director*

Prof. Hanken utilizes laboratory-based analyses and field surveys to examine morphological evolution, developmental biology and systematics.

Current areas of research include the evolution of craniofacial patterning, the developmental basis of morphological novelty, biodiversity informatics, and systematics and evolution of neotropical and Asian salamanders and frogs.

Prof. Hanken also serves on the Steering Committee of the Encyclopedia of Life (eol.org).

**Farish A. Jenkins, Jr.**

*Professor of Biology
Harvard College Professor
Alexander Agassiz Professor of Zoology
Curator of Vertebrate Paleontology*

Prof. Jenkins' research interests are broadly in the area of vertebrate evolution, focusing on comparative anatomy of fossil and recent vertebrates and the evolutionary pathways of structural and functional development. Prof. Jenkins

maintains active field research in vertebrate paleontology and, in 2006, was part of an expedition that discovered *Tiktaalik roseae*, the missing link between fish and land animals, in the Canadian Arctic.

**George V. Lauder**

*Professor of Biology
Henry Bryant Bigelow Professor of Ichthyology
Curator of Ichthyology*

Prof. Lauder's research examines the structure, function and evolution of vertebrates, particularly fishes and amphibians. His current studies focus on the development of robotic models for understanding the functional and evolutionary diversity of fishes.

Additional interests include biological fluid mechanics, theoretical approaches to the analysis of form and function in organisms, and the history and philosophy of morphology and physiology.



Jonathan B. Losos

*Monique and Philip Lehner Professor for the Study of Latin America
Curator of Herpetology*

Prof. Losos' research focuses on the behavioral and evolutionary ecology of lizards, specifically how lizards interact with their environment and how lizard clades have diversified evolutionarily. Addressing such questions requires integration of behavioral, ecological, functional morphological and phylogenetic studies.

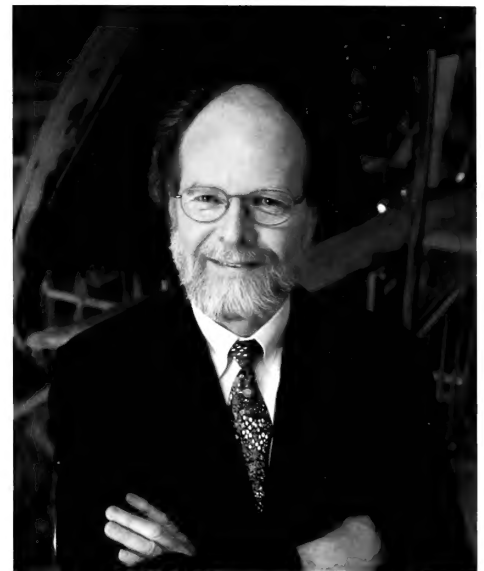
His research, with an emphasis on *Anolis* lizards in the Caribbean Islands, combines field observations, laboratory studies of lizard physiology and DNA, and field experiments to study evolutionary changes in nature.

Prof. Losos has spent decades conducting fieldwork that charts the evolution of multiple species of lizards in real time. By conducting rigorous biological and behavioral analyses of animals on small isolated islands, Losos has produced detailed empirical scientific evidence documenting how evolution occurs in natural populations. His research has demonstrated rapid changes based on introduced predators, altered competition and even hurricanes, proving that evolution can occur very rapidly and evolutionary biology can, in fact, be an experimental science.

The Losos laboratory consists of six postdoctoral researchers, seven graduate students and four undergraduates, as well as a number of visiting foreign graduate students. The lab employs approaches across the disciplines of systematics, ecology, behavior, genetics and functional morphology, taking both observational and experimental approaches in the field and in the laboratory. A major focus has been the evolutionary radiation of Caribbean *Anolis* lizards, but increasingly the focus of the lab is turning toward the evolution of mainland anoles, as well as other lizard radiations.



Rose Lincoln

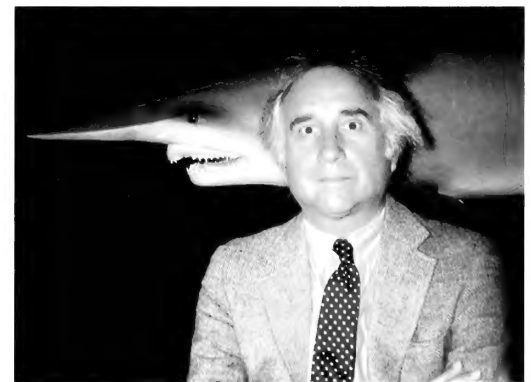


Jon Chase

James J. McCarthy

*Professor of Biological Oceanography
Alexander Agassiz Professor of Biological Oceanography
Acting Curator of Malacology*

Prof. McCarthy's research focuses on factors that regulate the processes of primary production and nutrient supply in the ocean. Through controlled laboratory studies and field investigations, Prof. McCarthy and his group examine the effects of strong seasonal or interannual climate change on marine life and biogeochemical systems.



Jean-Francois Bertrand

Naomi E. Pierce

*Sidney A. and John Hessel
Professor of Biology
Curator of Entomology*



Prof. Pierce is interested in behavioral ecology and the evolution of cooperation between species. Research in her lab focuses primarily on symbiosis between social insects and other organisms. Current interests include how the gut microbe has influenced the ecology and evolution of ants, how genes and the environment interact in the evolution of social behavior and pollination biology of bees, and how complex interactions between ants, plants, endophytic fungi and bacteria affect the evolution of mutualism in tropical ant-plant systems.



Robert M. Woollacott

*Professor of Biology
Curator of Marine Invertebrates*

Prof. Woollacott's research focuses on aspects of marine invertebrate life history, such as synchronization of reproductive events and ecology and physiology of larvae. Topics of particular interest include larval dispersal and population connectivity, as well as human impacts on the distribution of marine organisms.



MCZ EMERITI



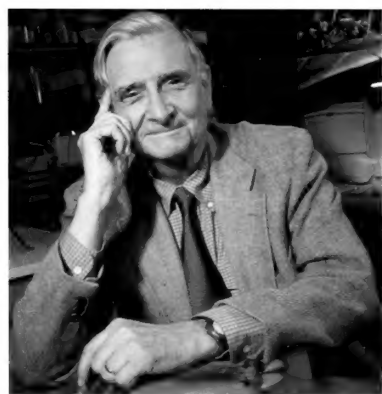
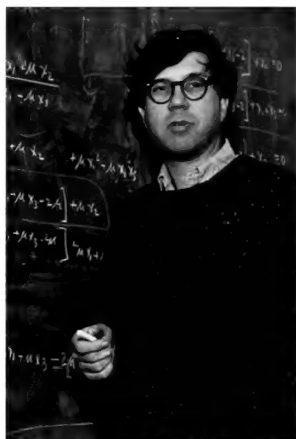
Kenneth J. Boss
Faculty-Curator, Emeritus
Professor of Biology, Emeritus

Prof. Boss, former Curator of Malacology, has been with Harvard for 40 years. His research focus is the classification, systematics and

evolution of mollusks, using data from shell morphology, anatomy and zoogeography to analyze the phylogenetic relationships within various groups of gastropods and bivalves. He has also published on the history of malacology. Prof. Boss has contributed extensively to the *Occasional Papers on Mollusks* and formerly served as editor for *Breviora* and the *Bulletin of the Museum of Comparative Zoology*.

Richard C. Lewontin
Professor of Biology, Emeritus
Alexander Agassiz Professor of Zoology, Emeritus

An evolutionary geneticist, Prof. Lewontin pioneered the field of molecular population genetics by merging molecular biology and evolutionary theory, as well as the philosophical and social implications of genetics and evolutionary theory. Prof. Lewontin's current research involves computer simulation and evaluation of statistical tests for selection. Among his many books are *The Genetic Basis of Evolutionary Change*, *Biology as Ideology: The Doctrine of DNA*, *Human Diversity*, and *The Triple Helix: Gene Organism and Environment*. He served as President of the Society for the Study of Evolution, the American Society of Naturalists and the Society for Molecular Biology and Evolution.



Edward O. Wilson
Honorary Curator in Entomology
Pellegrino University Professor, Emeritus

Prof. Wilson is considered the founder of sociobiology and evolutionary psychology and has developed the basis of modern biodiversity conservation. He has received many of the world's leading prizes in recognition of his research and environmental activism. He was awarded two Pulitzer Prizes for his books *The Ants* (1990, with Bert Hölldobler) and *On Human Nature* (1978). In 2007, Prof. Wilson received the Technology, Entertainment, Design (TED) Prize, where he articulated the concept of the Encyclopedia of Life—a contemporary, dynamic Web page for every named species.

A. W. "Fuzz" Crompton
Faculty-Curator, Emeritus
Fisher Professor of Natural History, Emeritus

Prof. Crompton, former Curator of Mammalogy, was the Director of the MCZ from 1970 to 1982 and the former Director of the Peabody Museum of Natural History, Yale University, and the South African Museum, Capetown. His primary research interests are the origin and evolution of mammals, functional anatomy, neural control and evolution of feeding in recent and fossil vertebrates. Prof. Crompton is a fellow of the American Academy of Arts and Sciences and the American Association for the Advancement of Science. He received two Guggenheim fellowships for his research on vertebrate paleontology and functional morphology and in 2011 received the Romer-Simpson Medal from the Society of Vertebrate Paleontology.



Justin Ide

Herbert W. Levi
Faculty-Curator, Emeritus
Alexander Agassiz Professor of Zoology, Emeritus

A former Curator of Arachnology, Prof. Levi's research focuses on the taxonomy of New World orb weaving araneid spider genera. The author of *Spiders and Their Kin*, as well as numerous articles on various spider genera, his research has made possible identification of 1,500 species in 66 genera in the Americas. Prof. Levi served as president of the International Society of Arachnology and, in 2007, won the ISA's Eugene Simon Award for lifetime achievement for his immense influence on spider research.



Courtesy of the Ernst Mayr Library



COURSES IN 2011–2012 LED BY MCZ FACULTY-CURATORS

Organismic and Evolutionary Biology

OEB 51: Biology and Evolution of Invertebrate Animals (undergraduate)

Gonzalo Giribet (and Cassandra G. Extavour)
Introduction to invertebrate diversity, with special emphasis on the broad diversity of animal forms, their adaptations to different ecosystems and how these phenomena shape animal evolution.

OEB 53: Evolutionary Biology (undergraduate)

Hopi E. Hoekstra (and Andrew J. Berry)
Micro- and macro-evolution, ranging from population genetics through molecular evolution to the grand patterns of the fossil record.

OEB 57: Animal Behavior (undergraduate)

Naomi E. Pierce (and Bence P. Olveczky)
A review of the behavior of animals under natural conditions, with emphasis on both mechanistic and evolutionary approaches.

OEB 118: Biological Oceanography (undergraduate and graduate)

James J. McCarthy
Examines the ocean as an ecological system, with focus on environmental-organismal interactions that regulate plankton production and transfer to higher trophic levels.

OEB 121a: Research in Comparative Biomechanics (undergraduate and graduate)

Andrew A. Biewener, George V. Lauder
(and Daniel E. Lieberman, Stacey A. Combes)
Introduction to experimental techniques used to investigate the structure and physiology of vertebrates, where each instructor offers research projects that are undertaken in their laboratory.

OEB 121b: Research in Comparative Biomechanics (undergraduate and graduate)

Andrew A. Biewener, George V. Lauder
(and Daniel E. Lieberman, Stacey A. Combes)
Optional extension of initial project undertaken in OEB 121a into a thesis research project.

OEB 141: Biogeography (undergraduate and graduate)

Gonzalo Giribet
Biogeography aims to explain distributions of organisms through historical and ecological factors. This course focuses on the history of biogeographic research, developments in the area of historical biogeography, and ecological processes that affect distributions of whole clades.

OEB 150: Vertebrate Evolution and Development (undergraduate and graduate)

Farish A. Jenkins, Jr. (and Arkhat Abzhonov)
A survey of the evolution and development of major groups of vertebrates, integrating the paleontological record of their origin with current understanding of the genetic, cellular and developmental mechanisms that underlie these transformations.

OEB 155r: Biology of Insects (undergraduate and graduate)

Naomi E. Pierce (and Michael R. Canfield)
Introduction to the major groups of insects—life history, morphology, physiology and ecology—through a combination of lecture, lab and field exercises.

OEB 167: Herpetology (undergraduate and graduate)

James Hanken and Jonathan Losos
Introduction to the biology of amphibians and reptiles. Lectures and laboratories examine the morphology, systematics, natural history, behavior,



OEB 51: Biology and Evolution of
Invertebrate Animals



ecology, evolutionary relationships and biogeography of all major taxa.

OEB 173: Comparative Biomechanics (undergraduate and graduate)

Andrew A. Biewener (and Jacques Dumais)

An exploration of how animals and plants contend with their physical environment, considering their biomaterial properties, structural form and mechanical interactions with the environment.

OEB 190: Biology and Diversity of Birds (undergraduate and graduate)

Scott V. Edwards

Introduction to the biology of birds, covering fossil record and theories for avian origins, physiology and anatomy, speciation processes, nesting and courtship behavior, vocalizations, breeding, demography and conservation.

OEB 275r: Phylogeography and Geographic Variation in the Era of Genomics (graduate)

Scott V. Edwards

Explores the ways in which comparative genomics can inform phylogeny and genomic adaptation, surveying recent methods for harnessing thousands of loci for phylogenetic reconstruction.

OEB 296: Conservation History, Values and Law (graduate)

Jonathan Losos (and David R. Foster)

Examines the history of the conservation/preservationist movements, focusing on how various constituencies value nature, and the legal system for protecting nature.

Graduate Courses of Reading and Research

OEB 307: Biomechanics, Physiology and Musculoskeletal Biology

Andrew A. Biewener

OEB 310: Metazoan Systematics

Gonzalo Giribet

OEB 320: Biomechanics and Evolution of Vertebrates

George V. Lauder

OEB 323: Advanced Vertebrate Anatomy

Farish A. Jenkins, Jr.

OEB 325: Marine Biology

Robert M. Woollacott

OEB 334: Behavioral Ecology

Naomi E. Pierce

OEB 341: Coevolution

Brian D. Farrell

OEB 345: Biological Oceanography

James J. McCarthy

OEB 355: Evolutionary Developmental Biology

James Hanken

OEB 362: Research in Molecular Evolution

Scott V. Edwards

OEB 367: Evolutionary and Ecological Diversity

Jonathan Losos

OEB 370: Mammalian Evolutionary Genetics

Hopi E. Hoekstra



Amanda Lu

OEB 190: Biology and Diversity of Birds





Freshman Seminar 31v: The Beasts of Antiquity and Their Natural History

Freshman Seminar

FRSEMR 31v: The Beasts of Antiquity and Their Natural History

Farish A. Jenkins, Jr. (and Kathleen M. Coleman)

A study of the animals of the ancient Mediterranean Basin, offering parallel introductions to the classics and organismal and evolutionary biology. Includes firsthand study of specimens in the MCZ and coins and artifacts from Harvard's collection of antiques.

Life Sciences

LIFESCI 1b: An Integrated Introduction to the Life Sciences: Genetics, Genomics and Evolution (undergraduate)

Hopi E. Hoekstra (and Maryellen Ruvoilo, Andrew J. Berry)

This course uses an integrated approach to show how genetics and evolution are intimately related, together explaining the patterns of genetic variation we see in nature, and how genomics can be used to analyze variation.

LIFESCI 2: Evolutionary Human Physiology and Anatomy (undergraduate)

George V. Lauder (and Peter T. Ellison, Daniel E. Lieberman)

Explores human anatomy and physiology from an integrated framework, combining functional, comparative and evolutionary perspectives on how organisms work.

General Education

Science of Living Systems 18: Evolutionary Biology: Sex, Survival and the Orgy of Species (undergraduate)

Jonathan Losos

Examines theories of how evolution occurs, including runaway sexual selection, sperm competition, adaptive radiation, disruptive selection, sympatric speciation and host-parasite interactions.



OLB 16: Hoplostethus



**Science of Living Systems 22:
Human Influence on Life in the Sea
(undergraduate)**

Robert M. Woollacott and James J. McCarthy

Over-harvested fish stocks, pollution and anthropogenic climate change affect the stability and productivity of marine ecosystems. This course asks what we need to know about the causes and effects of anthropogenic change to best protect marine ecosystems and ensure sustainable harvests from the sea.



Ciarré Lee

OEB 167: Herpetology

**Harvard Extension School
and Harvard Summer
School**

**BIOS S-74: Marine Life and
Ecosystems of the Sea**

Robert M. Woollacott

The life history and adaptations of marine life and the ecosystems of the sea, with emphasis on understanding the fragility and resilience of marine systems in the face of anthropogenically driven perturbations.

**BIOL S-113: Study Abroad at
Oxford: Darwin and Contemporary
Evolutionary Biology**

Naomi E. Pierce (and Andrew Berry)

The history of evolutionary biology in the post-Darwinian world, following strands of thought either introduced or ignored by Darwin in *On the Origin of Species* through to the present.



Scott Edwards

OEB 190: Biology and Diversity of Birds



OEB 155r: Biology of Insects





Jeremiah Trimble

SIGNIFICANT ACQUISITIONS AND UPGRADES ENHANCE MCZ COLLECTIONS

The past year has brought important enhancements to the MCZ collection through expeditions, private donations and curatorial upgrades.

MCZ Expedition Collects Mongolian Birds

Despite some holdings in U.S. museums and older specimens in Russia, Mongolian birds are otherwise poorly represented in the world's museum collections, especially modern, data-rich specimens. In June 2012 **Scott V. Edwards** and colleagues traveled to Mongolia to improve the global collection of high-quality voucher specimens of Mongolian birds. The expedition was funded by a Putnam Expedition Grant and the MCZ's Blake Fund.

Edwards—Curator of Ornithology, Professor of Organismic and Evolutionary Biology and Alexander Agassiz Professor of Zoology—was accompanied by graduate student **Allison Shultz**, Edwards lab postdoctoral fellow **Niclas Backström** and Curatorial Associate **Jeremiah Trimble**. The team was hosted by leading Mongolian ornithologist and conservationist Sundeв Gomboobaatar from the National University of Mongolia, his students and staff.

Three weeks were spent collecting specimens in the drier foothill steppe near the capital Ulaanbaatar (such as around Hustai National Park), taiga forest near Terelj National Park to the north, thickets and riverbanks of the Onon River Valley, in the hills around Binder Sum and the vast steppes of the far eastern regions.

The group collected about 150 specimens, meticulously preparing tissue samples and voucher specimens that will inhabit MCZ trays in the collection. Some of the most exciting and colorful were Bearded Reedlings (*Pamurus hiarmicus*) from the far east; Siberian Rubythroats (*Luscinia calliope*); Eurasian Wrynecks (*Jynx torquilla*), a primitive type of woodpecker found

only in the Old World; and Eurasian Three-toed Woodpeckers (*Picoides tridactylus*).

As a general collection the Mongolian vouchers, tissues and spread wings will be available for use by researchers worldwide. The specimen data will be deposited in the museum's database, MCZbase, and will eventually be accompanied by digital photographs of habitats, photos of live birds and field notes. These collections are important for future studies in phylogeography, which focuses on geographic variation within species.



Scott V. Edwards

Allison Shultz removing a Eurasian Magpie (*Pica pica*) from a net

"Specimens are like a snapshot of the environment, and given the diverse chemical, morphological and genetic uses to which specimens today can be put, I have no doubt they will attract further interest in the ornithology collection here," says Edwards. According to Trimble, the department has already received a request for high-quality tissue samples from some of the specimens from a researcher studying plumage coloration.

Institutions like the MCZ have a role to play in supporting continuing education and infrastructure building in countries with substantial biodiversity, and the work helped establish ties to Mongolian scientists and students.

Jeremiah Trimble



Malacology Collection Receives Important Donations

This year, the MCZ's collection of 10 million shells was supplemented by just over 10,000 mollusk lots given to the Department of Malacology by Owen Gingerich, Domenick Nicolaci, Gonzalo Giribet and the family of Joseph George Claud-Mantle.

The Joseph George Claud-Mantle Collection was received in June 2011. It contains 5,200 shells representing almost 4,000 species acquired between 1880 and 1930, including the ultimate rare and valuable seashell, a sinistral sacred chank shell (*Turbinella pyrum*) from India.

In 2008, Claud-Mantle's great-granddaughter Laura Ferrera and her cousins Deborah Lasnier and Cindy Arendt began the four-year project to clean and document the collection, taking inventory using their great-grandfather's original logbooks and creating an electronic database and online photo gallery of the shells.

According to **Adam J. Baldinger**, Curatorial Associate of Malacology, "It isn't unusual to receive collections from private collectors, but I have rarely seen a collection that was so diligently catalogued. The collection's true value is scientific and lies in the precise way Claud-Mantle recorded data about each of his shells."

The extremely rare sinistral, or left-handed chank, is revered as a religious object in Hindu temples, and it has been estimated that there are only three specimens in North America. In January 2012 a previously unknown specimen was discovered in the Claud-Mantle collection, and it became the subject of a paper by Baldinger and Edward Nieburger in *American Conchologist*.

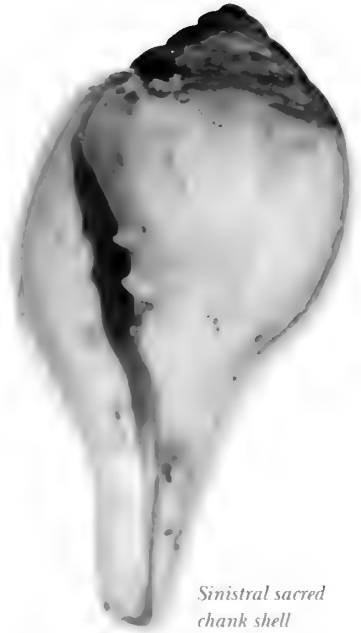
Additionally 1,117 specimen lots were received from Domenick Nicolaci from North Dartmouth, Massachusetts. The collection contains specimens collected from around the world and includes the rare golden form of the cowrie *Zoila friendii* from Australia and a rather large specimen

of the volute *Cymbiola (Cymbiolacea) thatcheri* from northeast Australia.

Owen Gingerich, former Research Professor of Astronomy and the History of Science at Harvard University, is an amateur shell collector and longtime member of the Boston Malacology Club. His shell collection contains many unique specimens, including several listed in *Guinness World Records*. Gingerich began donating parts of his collection to the MCZ in 2009, and in 2011, the MCZ received 773 specimens representing 23 different families.

From 2010 to 2012 **Gonzalo Giribet**, Curator of Invertebrate Zoology and Professor of Organismic and Evolutionary Biology, donated his collection of 3,041 specimen lots. The collection's emphasis is on the Mediterranean region and nearby Atlantic, but also includes specimens from other oceans and continents around the world.

This collection was amassed during more than 30 years, and unlike many other private collections, a large portion of specimens were micro-mollusks, many collected directly by Giribet during zoological and ecological surveys in the northwest Mediterranean. The donation fills an important geographical gap in the MCZ collections.



Sinistral sacred chank shell

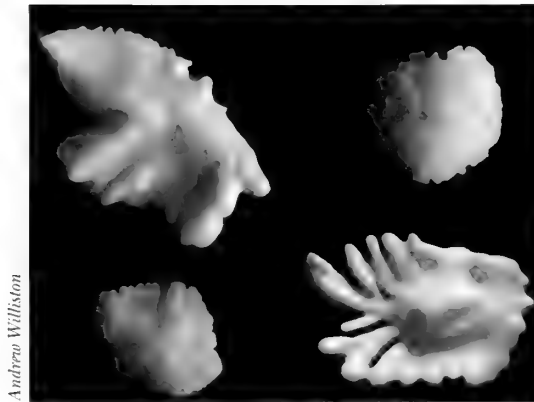
Descendants of Joseph George Claud-Mantle visiting his collection in the MCZ's malacology department. From left: Vivian Lasnier, Cindy Arendt, Deborah Lasnier, Gloria Lasnier and Laura Ferrera



Adam Baldinger



Otolith Collection Enhancements



Andrew Williston

Over the years the MCZ has received more than 800,000 fishes from Woods Hole Oceanographic Institution cruises. Jim Craddock, a former MCZ associate, removed the otoliths—ear bones—from many of those specimens to use in the study of the food habits of marine mammals. After his death in 2009, his wife Thelma Fenster donated 3,000 sets of fish otoliths from about 450

individual species, many from voucher specimens already housed at the MCZ. The collection has been completely inventoried and organized, and Curatorial Assistant **Andrew Williston** is entering collection data, including the original locality data, into MCZbase. Ichthyology intern **Rex Passion** completed the collection inventory and collection data review.

“Otoliths are a valuable resource in defining fish species and studying fish ecology,” says Williston. “Growth rings in otoliths can be studied for aging individual fish. They can be used to identify fish remains in the stomach contents of marine predators like dolphins, and fish diets can be studied using stable isotope analysis of otoliths. And since otoliths are often fossilized, they can be compared to modern otoliths to better understand the diversity of fossil fishes.”

Crinoid Collection Upgrades

The recent work of Curatorial Assistant **Penny Benson** and temporary employee **Beryl Lipton** has brought specific parts of the MCZ Department of Marine Invertebrates collection up to and beyond modern day best-practice standards. This past year the curatorial upgrades were focused on the crinoid (sea lily and feather star) and holothuroid (sea cucumber) collections and included

confirmation of specimen collection data, taxonomy and type status utilizing MCZbase, and rehousing specimens into new jars and trays along with updated archival labels.

“The history, species diversity and number of types represented within the MCZ crinoid and holothuroid collections are truly amazing. And now with collection data available electronically, interest and use of the collection has definitely increased,” says Curatorial Associate **Adam J. Baldinger**.



Penny Benson (right) and Beryl Lipton



Breda Zimkus

The new MCZ Cryogenic Collection includes a preparation laboratory and adjoining freezer room where genetic samples will be barcoded and stored in one of three liquid nitrogen cryovats, each accommodating 40,000 samples.

Victoria Wilke



MCZ RESEARCH MAKING HEADLINES

Observing Evolution in Action

Rowan Barrett is conducting a grand experiment on Nebraska's sand dunes, involving thousands of feet of galvanized steel sheets, hundreds of live mice, natural aerial predators and a cadre of researchers wielding traditional and genetic tools—all to examine the real-time effects of evolution in nature.

Peromyscus maniculatus, or deer mice, have light fur that blends in with the sand when they live on the dunes. The same mice living in the darker prairie soil have correspondingly dark coats. The assumption is that the lighter pigmentation of the mice in the Sand Hills is an adaptation that evolved to provide camouflage from predators such as hawks and owls, thereby increasing their “fitness”—or ability to survive and reproduce—in a textbook example of natural selection.

The question is whether or not this explanation—however plausible—is accurate. To test this theory, Barrett, mentor **Hopi E. Hoekstra** and members of the Hoekstra lab, including several undergraduates, are examining the mutations that arise in a group of wild mice, how they affect physical appearance and how that gives certain individuals a better chance at reproducing.

The multi-year experiment involves eight enclosures, 150-foot square, four constructed on dark soil and four on sand dunes. The enclosures—each stocked with around a hundred mice, half with dark and half with light coats—are otherwise natural mouse habitats subject to predation.

To track each individual's survival and reproductive success, every mouse is photographed and its coat color measured with a spectrophotometer, then visually tagged and radio chipped, and finally genetically sampled by the researchers. Every six weeks traps will be laid in the pens to check the frequencies of genetic variants and monitor changes. This data will help the researchers understand how genes are linked to physical appearance, and how both are linked to fitness and how quickly evolution occurs under these conditions. A review of the study design was published in *Nature Reviews Genetics*.

Barrett RDH, Hoekstra HE (2011) Molecular spandrels: tests of adaptation at the genetic level. *Nat Rev Genet* 12:767-780.



Rowan Barrett



Rowan Barrett

And the Gold Goes to... Speedos, Silicone or Shark Skins?

Biomimetics refers to employing inspiration from biological systems to help design or improve human-made materials and machines. One such inspiration comes from the skin of sharks, whose tiny toothlike denticles have long been suspected of improving the animals' swimming speed and efficiency.

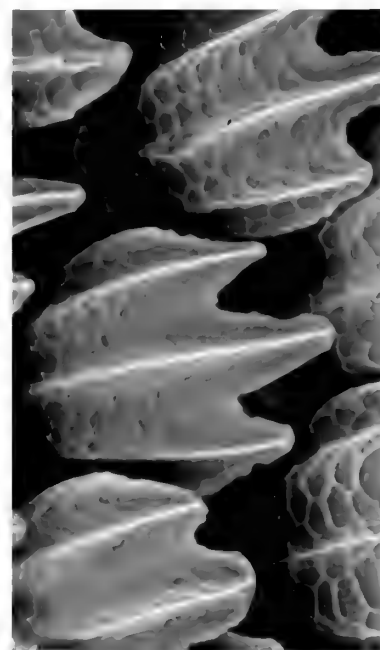
To test this hypothesis—and to evaluate purported shark skin-like materials for boats, aircraft and racing swimwear—**George V. Lauder** and Johannes Oeffner conducted a series of experiments using a robotic flapping foil device, high-speed lasers and minute particles in the water to measure any increase in self-propelled swimming speed due to the drag-reducing properties of the surface texture.

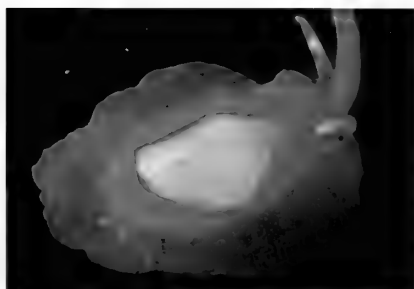
The results, reported in *The Journal of Experimental Biology*, found that skins from

fast-swimming mako and porbeagle sharks increased swimming speed by 12.3%. Silicone riblet material, created to reduce drag on sailboats and improve the fuel consumption of airplanes, was found to be 7.2% more efficient than smooth-surfaced silicone. But the “shark skin-like” Speedo® Fastskin II material generated no increase in speed when compared to that of a regular swimsuit.

However, Lauder pointed out that other factors related to this type of racing suit—such as the tight construction leading to a streamlined profile, improved circulation and posture—most likely contribute to faster swimming speed in humans.

Oeffner J, Lauder GV (2012) The hydrodynamic function of shark skin and two biomimetic applications. *J Exp Biol* 215:785-795.

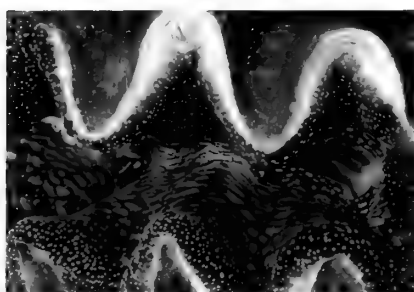




Gonzalo Giribet



Gonzalo Giribet



Gonzalo Giribet

Genetic Analysis Resolves the Evolutionary Relationships of Mollusks

Mollusks—snails, octopuses, clams and their relatives—are some of the most numerous and best studied of all animal groups. However, ill-defined relationships among the diverse mollusk species have stymied the search for answers to many evolutionary questions, such as whether shell-less mollusks diverged before the development of their shelled brethren, or if they originally had shells but lost them later in their evolution.

Results of advanced and extensive genetic analysis—and completion of the most comprehensive evolutionary tree for Mollusca to date—were reported by **Gonzalo Giribet** and colleagues in *Nature*.

The team sequenced nearly every gene in dozens of mollusk species before selecting 1,800 genes to be compared across them, thus reconstructing the mollusk phylogeny, or how all mollusk species are related evolutionarily.

The researchers found, somewhat surprisingly, that bivalves, such as clams and oysters, are most closely related to gastropods like limpets, snails and slugs. They also determined that monoplacophorans, an ancient group of mollusks thought to be extinct for hundreds of millions of years until their rediscovery in the early 1950s, are most closely related to cephalopods like the chambered *Nautilus*, octopus and squid.

Understanding the phylogeny of an animal is a critical first step in establishing homology among its morphological characters and determining how it developed and evolved over millions of years. The research also serves as proof-of-concept, demonstrating how genomic techniques can be successfully employed to answer difficult and elusive evolutionary questions even when using non-model organisms.

Smith S, Wilson NG, Goetz F, Feehery C, Andrade SCS, Rouse GW, Giribet G, Dunn CW (2011) Resolving the evolutionary relationships of molluscs with phylogenomic tools. *Nature* 480:364-367.

Pigeon Flight Resembles That of Helicopters and Hummingbirds

To avoid obstacles, chase prey or evade predators, the ability of an animal to turn is of the utmost importance. Turning consists of changes in the path of travel and body orientation. For birds and other flying animals, this is achieved by modulating aerodynamic forces relative to gravity. Understanding how birds coordinate aerodynamic force production relative to their body position is the subject of research conducted by **Ivo G. Ros** and **Andrew A. Biewener**.

Ros and Biewener constructed a netted hallway containing a 90-degree turn and trained pigeons (*Columba livia*) to fly between perches on either end. The pigeons' bodies were marked in 16 places, and high-speed synchronized cameras were used to measure net aerodynamic force and changes in body orientation as the birds flew and executed the turn at slow speeds. Surprisingly, the pigeon's upstroke generated aerodynamic forces that were approximately 50% of those generated during the downstroke, nearly matching that of hummingbirds. They found that the pigeons used body rotations to change flight paths and continued to flap their wings as if they were flying straight ahead, analogous to helicopters and many flying insects. The findings were reported in *Proceedings of the National Academy of Sciences of the USA*.

Ros IG, Bassman LC, Badger MA, Pierson AN, Biewener AA (2011) Pigeons steer like helicopters and generate down and upstroke lift during low speed turns. *P Natl Acad Sci USA* 108:19990-19995.



Fulbright Scholar Brian Farrell



Ruth Bastardo

From July 2011 to July 2012, **Brian Farrell** was in the Dominican Republic as a Fulbright Scholar to the Universidad Autónoma de Santo Domingo. Founded in 1538, it was the first university in the western hemisphere.

Together with MCZ Associate Prof. Ruth Bastardo, Farrell established a US-style learning laboratory where Dominican and visiting American undergraduates can work with natural history collections. They expanded the scope of lab-based activities so that there are now five students digitizing and curating their collections alongside their thesis work on topics ranging from fungi to bioacoustics.

Farrell curated two cabinets of MCZ specimens housed at UASD that he collected in earlier years and established

a 200-volume library of references for entomology/botany and evolution biogeography and ecology. He hosted workshops in bioacoustics and bee systematics, and coauthored a biology textbook that draws on many examples and case studies from Hispaniola.

Farrell and Bastardo also inaugurated a new phase in the joint digital imaging program, a collaborative project to inventory insects in the National Botanical Garden. The program is modeled after the effort with the MCZ entomology type specimens and the Boston Harbor Islands in which students are trained by former students.

"This kind of cultural and scientific exchange, connecting small museums and universities with larger ones, is the future of natural history collections, as well as education in biology," says Farrell. "Everyone benefits."

Farrell's efforts were funded by the US Fulbright Scholars Program, the David Rockefeller Center for Latin American Studies at Harvard, the National Science Foundation and the US Embassy in Santo Domingo.



Brian Farrell

UASD students Candy Perez and America Sanchez enter data for insect specimens. At left: Brian Farrell and America Sanchez build insect drawers.

MCZ History: Alfred Russel Wallace

Among Louis and Alexander Agassiz's many important contributions to the world of natural history museums was the idea of designing public exhibits according to biogeography—clustering species from the collections based on where they occur naturally. This novel idea was immediately appreciated by 19th-century English explorer and naturalist Alfred Russel Wallace, who visited the MCZ and wrote about it in his book *American Museums* (1887):

"The most cursory inspection ... will teach the visitor a lesson in natural history that he will not learn by a dozen visits to our great national storehouse at South Kensington—the lesson that each continent has its peculiar forms of life, and that the greatest similarity in geographical position and climate may be accompanied by a complete diversity in the animal inhabitants."

"Professor Agassiz intended his museum ... 'to illustrate the history of creation, as far as the present state of scientific knowledge reveals that history.' It is surely an anomaly that the naturalist who was most opposed to the theory of evolution should be the first to arrange his museum in such a way as best to illustrate that theory"



MCZ exhibition of South American fauna, 1892



PROJECTS & INITIATIVES



In May 2012, EOL (eol.org) reached the milestone of one million species pages, just over half of the 1.9 million recognized species on Earth. The EOL Learning + Education Group (education.eol.org), headquartered at the MCZ, is charged with developing tools to facilitate the use of EOL data and to develop innovative ways that EOL can be integrated into biodiversity learning.

Updated Educational Tools



EOL Learning + Education Group released a major update to its education tools and applications (fieldguides.eol.org) with the redesigned Field Guide tool, the new Ecosystem Explorer (beta), and the new Bingo Game generator, all using the EOL collections. The EOL Field Guide tool organizes EOL

species information by creating customized guides for individual projects or interests. Ecosystem Explorer allows anyone to build and explore ecosystems of species through an interactive graphing tool. Middle and high school students can build an “ecosystem” by providing a list of taxa and then defining the interactions. The Bingo Site is a fun way to interact with an EOL collection, especially for younger audiences, through the creation of an online or print format bingo game of EOL images.

EOL Rubenstein Fellow

Rosario Casteñeda, a postdoctoral fellow in Herpetology and member of the Losos Lab, is a 2012 EOL Rubenstein Fellow. The program supports the research of scientists for up to one year to translate biodiversity research, databases and media into rich, online resources through the Encyclopedia of Life. Casteñeda is an evolutionary biologist who integrates data collected in the field, laboratory and museum collections.



Rosario Casteñeda

Her research interests are phylogenetics, population genetics, character evolution, conservation and taxonomy of *Anolis* lizards. During her fellowship she will create new content, revise and complement previous EOL pages for all species of *Anolis* lizards.

Education Innovation Challenge

The EOL Education Innovation Challenge is an international competition that aims to stimulate the development and implementation of educational software tools, services, games and activities involving the Encyclopedia of Life. The Challenge is to use EOL content and services to create an engaging and educational application that will promote global learning activities focused on discovering and understanding the living world. The competition seeks to highlight the most scalable and innovative applications that facilitate learning, participation and sharing of information about biodiversity, ecological relationships and natural history.

Google Earth Tours & Podcasts



A new EOL Collection of *Biodiversity on the Move* Google Earth Tours uses scientific and geographic data to tell stories about biodiversity and employs videos to make the natural world come alive.

education.eol.org/page/eol-google-earth-tours

One Species at a Time podcasts are highly engaging five-minute audio pieces that link to content for more than 50 species in EOL. The podcasts are accompanied by a “Meet the Scientist” feature page, multimedia extras, interesting facts, relevant educational materials and calls for listener participation. education.eol.org/podcast



Ernst Mayr Library's Visual Treasures

Natural history illustrations are a rich source of knowledge for a broad spectrum of scholars and educators. Aside from their aesthetic qualities, detailed illustrations of plants and animals are critical, even today, for biologists tracing the taxonomic history of an organism or as documentation for lost or discarded specimens. Before the advent of photography, botanical and zoological artists were necessary partners for documentation of scientific expeditions.

"For centuries, natural history illustrations provided a window to biodiversity around the world for scientists and the public who could not travel," says **Constance Rinaldo**, Librarian of the Ernst Mayr Library. "Thus artwork is integral to a natural history library collection."

Notable recent acquisitions are two framed original prints from Audubon's *Quadrupeds of North America* and original hand-colored engravings by Mark Catesby from *The Natural History of Carolina Florida & the Bahama Islands*, circa 1754. Dr. George C. Gorman (PhD in Biology, Harvard University '68) donated the prints.

To display the Ernst Mayr Library's historic illustrations, the Library is mounting periodic "flash" exhibits featuring priceless treasures that are not generally available for viewing. These exhibits have showcased ichthyological drawings, engravings and manuscripts from Special Collections such as the watercolors of Jacques Burkhardt from the Thayer Expedition to Brazil (1865–1866) and the works of Andrew Garrett (1823–1887). Another exhibit of original illustrations and rare books for "Save the Frogs Day" featured images from John Edwards Holbrook's *North American Herpetology* (1836).

And, in the next evolution of natural history illustration, Library staff plan to contribute to a new project centered at the Missouri Botanical Garden, called the "Art of Life." The results of this project will include new software tools for the automated identification and description of visual resources to "liberate natural history illustrations from the digitized books and journals in the online Biodiversity Heritage Library."

On the photographic front, the Library has begun conservation and documentation of the glass plate negatives of Alexander Agassiz, director of the MCZ from 1873 to 1910 and son of MCZ founder Louis Agassiz. The collection of around 1,000 gelatin dry plates, film negatives and prints dates from the late 1890s to the 1940s. The collection includes images from expeditions by the *Albatross*, *Challenger*, *Croyden* and *Yaralla* and covers such destinations as Australia, Brazil and Easter Island. This collection, including 200 film negatives, has long been part of the MCZ collections, but the unfamiliar format and limited information associated with the negatives have made documentation challenging.



Catesby's "Green Lizard of Jamaica"



Sorex parvus (Plate LXX)
from Audubon's *Quadrupeds*
of North America

In Spring 2012, thanks to a gift by Roger Fleishmann (Harvard University '56 and Harvard Law School '59), **Robert Young**, Special Collections Librarian, and **Gwendolyn Fougy Henry**, Library Assistant and Archivist, started the year-long process of organizing, arranging, researching, conserving, describing, digitizing and assigning metadata to the negatives. Once digitized, the EML will link the images to publications and specimens in the MCZ collections, making them available online for reference and research. The gift also enabled the purchase of a number of rare books, including a volume of the first edition of *De la nature* by Jean Baptiste René Robinet from 1761–1766.



Gwendolyn Fougy Henry

Joseph DeVera



Mollusks: Shelled Masters of the Marine Realm

The amazing diversity and history of mollusks are explored in a new exhibition curated by **Gonzalo Giribet**. *Mollusks: Shelled Masters of the Marine Realm* opened at the Harvard Museum of Natural History on February 18, 2012, and will run through February 2014.

Featuring recent discoveries about mollusks' evolutionary history and ongoing research by Prof. Giribet, colleagues and students in the Giribet laboratory, the exhibition engages the general public in the evolution of mollusks, their ecology and the many ways their lives intersect with ours.

Mollusks—snails, clams, squid and other invertebrates—comprise almost a quarter of all known marine species. The exhibition includes hundreds of shells from the collections in the MCZ's Department of Malacology, selected with the help of Curatorial Associate **Adam J. Baldinger**. Many of the specimens have never been on public display. The MCZ's collection, with close to 10 million specimens, is the largest and most diverse private collection



in the world. Visitors can also see a limited selection of newly restored glass models of an octopus and other mollusks created in the mid to late 19th century by Leopold and Rudolph Blaschka.

Prof. Giribet delivered the exhibition's opening lecture, *The Biology and Evolution of Mollusks*, on February 16.

Renovated Fishes Exhibition Opens

The redesigned *Fishes* exhibition, curated by **George V. Lauder**, with **Karsten Hartel** and **Andrew Williston** of the ichthyology department, opened at the Harvard Museum of Natural History on June 2, 2012.

The new gallery features a refurbished space and displays that explain both fish biology and the science being conducted on the topic at Harvard. *Fishes* combines abundant real specimens with 3-D models, colorful graphic displays and an interactive multimedia station profiling the research of faculty, staff and students in the Lauder laboratory. Exhibition topics include the evolution of fish,

the major groups and the ecology of fish and their migratory habits.

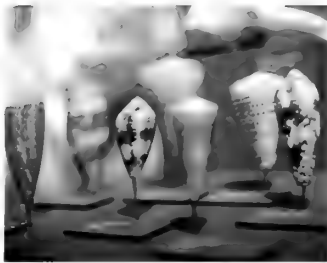
Many new specimens borrowed from the MCZ's ichthyology collections—such as an 88-inch-long South American arapaima, the world's largest freshwater fish—demonstrate the diversity of fishes that inhabit almost every habitat on Earth. Specimens also include longtime visitor favorites like the hammerhead and mako sharks, the massive bluefin tuna and the prickly porcupine fish.

The work was done in honor of Karel Liem, Curator of Ichthyology from 1972 to 2009, who is credited for much of the expansion of the MCZ fish collection, which grew from roughly 200,000 specimens in the 1960s to some 1.5 million today.

The exhibition's reopening lecture, *The Grand Diversity of Fishes: Form, Function and Evolution*, was presented on May 31 by Prof. Lauder.



Catherine Weisel



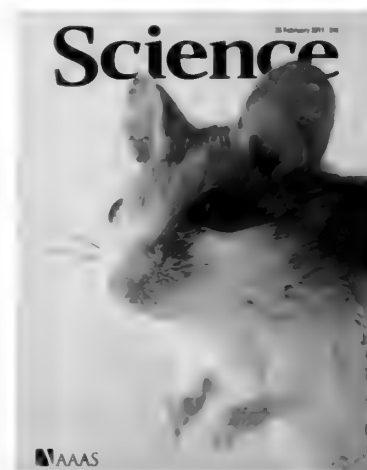
Stephanie Mitchell



Catherine Weisel



- **Aktipis SH, Boehm E, Giribet G** (2011) Another step towards understanding the slit-limpets (Fissurellidae, Fissurelloidea, Vetigastropoda, Gastropoda): a combined five-gene molecular phylogeny. *Zool Scr* 40:238-259
- **Alcaide M, Edwards SV** (2011) Molecular evolution of the toll-like receptor multigene family in birds. *Mol Biol Evol* 28:1703-1715
- **Alföldi J, Di Palma F, Fujita MK, Moreno RG, Janes DE, Organ CL, Sanger TJ, Edwards SV, Losos JB, et al** (2011) The genome of the green anole lizard and a comparative analysis with birds and mammals. *Nature* 477:587-591
- **Algar, AC, Losos JB** (2011) Evolutionary assembly of island faunas reverses the classic island mainland richness difference in *Anolis* lizards. *J Biogeogr* 38:1125-1137
- **AlRashidi M, Kosztolányi A, Shobrak S, Küpper C, Székely T** (2011) Parental cooperation in an extreme hot environment: natural behaviour and experimental evidence. *Anim Behav* 82:235-243
- **Archetti M, Scheuring I, Hoffman M, Frederickson ME, Pierce NE, Yu DW** (2011) Economic game theory for mutualism and cooperation. *Ecol Lett* 14:1300-1312
- **Archetti M, Úbeda F, Fudenberg D, Green J, Pierce NE, Yu DW** (2011) Let the right one in: a microeconomic approach to partner choice in mutualisms. *Am Nat* 177:75-85
- **Arnold AS, Richards CT, Ros IG, Biewener AA** (2011) There is always a trade-off between speed and force in a lever system: comment on McHenry (2010). *Biol Lett* 7:878-879
- **Barrett RDH, Hoekstra HE** (2011) Molecular spandrels: tests of adaptation at the genetic level. *Nat Rev Genet* 12:767-780
- **Basset Y, Eastwood R, Sam L, Lohman DJ, Novotny V, Treuer T, Miller SE, Weiblen GD, Pierce NE, Bunyavechewin S, Sakchoowong W, Kongnoo P, Osorio-Arenas MA** (2011) Comparison of rainforest butterfly assemblages across three biogeographical regions using standardized protocols. *J Res Lepidoptera* 44:17-28
- **Boiste, R, Herrel A, Lebrun R, Daghfous G, Tafforeau P, Losos JB, Vanhooydonck B** (2011) Shake rattle and roll: the bony labyrinth and aerial descent in squamates. *Integr Comp Biol* 51:957-968
- **Bonneaud CS, Balenger L, Russell AF, Zhang J, Hill GE, Edwards SV** (2011) Rapid evolution of disease resistance is accompanied by functional changes in gene expression in a wild bird. *P Natl Acad Sci USA* 108:7866-7871
- **Brischoux F, Gartner GEA, Garland Jr. T, Bonnet X** (2011) Is aquatic life correlated with an increased hematocrit in snakes? *PLoS ONE* 6:e17077
- **Carlson RL, Lauder GV** (2011) Escaping the flow: boundary layer use by the darter *Etheostoma tetrazonum* (Percidae) during benthic station holding. *J Exp Biol* 214:1181-1193
- **Clouse RM, de Bivort BL, Giribet G** (2011) Letter to the Editor: Phylogenetic signal in morphometric data. *Cladistics* 27:337-340
- **Clouse RM, General DM, Diesmos AC, Giribet G** (2011) An old lineage of Cyphophthalmi (Opiliones) discovered on Mindanao highlights the need for biogeographical research in the Philippines. *J Arachnol* 39:147-153
- **Collar DC, Schulte II JA, Losos JB** (2011) Evolution of extreme body size disparity in monitor lizards (*Varanus*). *Evolution* 65:2641-2663
- **Crompton AW** (2011) Masticatory motor programs in Australian herbivorous mammals. *Integr Comp Biol* 51:271-281
- **Crompton AW, Musinsky C** (2011) How dogs lap: ingestion and intraoral transport in *Canis familiaris*. *Biol Lett* 7:882-884
- **Culbertson MA, Lewis ZR, Nechiporuk AV** (2011) Chondrogenic and gliogenic subpopulations of neural crest play distinct roles during the assembly of epibranchial ganglia. *PLoS ONE* 6:24443
- **Cundiff JD** (2011) Working towards standardization: a survey of curation procedures in invertebrate paleontology collections. *Collection Forum* 25:22-61
- **Curet OM, Patankar NA, Lauder GV, MacIver MA** (2011) Aquatic maneuvering with counter-propagating waves: a novel locomotive strategy. *J Roy Soc Interface* 8:1041-1050
- **Curet OM, Patankar NA, Lauder GV, MacIver MA** (2011) Mechanical properties of a bio-inspired robotic knife-fish with an undulatory propulsor. *Bioinspir Biomim* 6:026004
- **Davidson RL, Rykken JJ** (2011) Rediscovery of *Bembidion* (*Lymnaeum*) *nigropiceum* (Marsham) (= *puritanum* Hayward) in Massachusetts, with remarks on biology and habitat (Coleoptera: Carabidae: Bembidiini). *ZooKeys* 147:487-496
- **Davidson RL, Rykken JJ, Farrell BD** (2011) Carabid beetle diversity and distribution in Boston Harbor Islands national park area (Coleoptera: Carabidae). *ZooKeys* 147:497-526
- **Edgecombe GD, Giribet G, Dunn CW, Hejnol A, Kristensen RM, Neves RC, Rouse GW, Worsaae K, Sørensen MV** (2011) Higher-level metazoan relationships: recent progress and remaining questions. *Org Divers Evol* 11:151-172
- **Flammang BE, Porter ME** (2011) Bioinspiration: applying mechanical design to experimental biology. *Integr Comp Biol* 51:128-132
- **Flammang BE, Ebert DA, Cailliet GM** (2011) Intraspecific and interspecific spatial distribution of three eastern North Pacific catshark species and their egg cases (Chondrichthyes: Scyliorhinidae). *Breviora* 521:1-18
- **Flammang BE, Lauder GV, Troolin DR, Strand TE** (2011) Volumetric imaging of fish locomotion. *Biol Lett* 7:695-698
- **Flammang BE, Lauder GV, Troolin DR, Strand TE** (2011) Volumetric imaging of shark tail hydrodynamics reveals a three-dimensional dual-ring vortex wake structure. *P Roy Soc B* 278:3670-3678
- **Fujita M, Edwards SV, Ponting C** (2011) The *Anolis* lizard genome: an amniote genome without isochores. *Genome Biol Evol* 3:974-984
- **Funaro CF, Kronauer DJC, Moreau CS, Goldman-Huertas B, Pierce NE, Russell JA** (2011) Army ants harbor a host-specific clade of Entomoplasmatales bacteria. *Appl Environ Microbiol* 77:346-350
- **Gartner GEA, Hicks JW, Andrade DV, Secor SM, Garland Jr T** (2011) Reply to "Heart position in snakes." *Physiol Biochem Zool* 84:102-106
- **Garwood RJ, Dunlop JA, Giribet G, Sutton MD** (2011) Anatomically modern Carboniferous harvestmen demonstrate early cladogenesis and stasis in opiliones. *Nature Comm* 2:444
- **Giribet G** (2011) *Shearogvea*, a new genus of Cyphophthalmi (Arachnida, Opiliones) of uncertain position from Oaxacan caves, Mexico. *Breviora* 528: 1-7



In the cover story of *Science*, Marie Manceau, Vera Domingues, Ricardo Mallarino, and Hopi E. Hoekstra published "The developmental role of Agouti in color pattern evolution."



Gabriel Gartner and colleagues contributed the cover story "Latitudinal and climatic variation in body size and dorsal scale counts in *Sceloporus* lizards: a phylogenetic perspective" to *Evolution*.



Invertebrate Systematics



"The evolutionary and biogeographic history of the armoured harvestmen—Laniatores phylogeny based on ten molecular markers, with the description of two new families of Opiliones (Arachnida)" by **Prashant Sharma** and **Gonzalo Giribet** was the cover story in *Invertebrate Systematics*.



George V. Lauder and colleagues contributed the cover story "Biomimicry from fish for smart material design and function" to *Smart Materials and Structures*.

- **Gross JB, Kerney R, Hanken J, Tabin CJ** (2011) Molecular anatomy of the developing limb in the coqui frog, *Eleutherodactylus coqui*. *Evol Dev* 35:415-426
- **Hanken J** (2011) Review of M.D. Laubichler and J. Maienschein, eds, *Form and Function in Developmental Evolution*. *Q Rev Biol* 86:142-143
- **Hedrick TL, Tobalske BW, Ros IG, Warrick DR, Biewener AA** (2011) Morphological and kinematic basis of the hummingbird flight stroke: scaling of flight muscle transmission ratio. *P Roy Soc B* 279:1986-1992
- **Herrel A, Cottam MD, Godbeer K, Sanger T, Losos JB** (2011) An ecomorphological analysis of native and introduced populations of the endemic lizard *Anolis maynardi* of the Cayman Islands. *Breviora* 522:1-10
- **Ingram, T** (2011) Speciation along a depth gradient in a marine adaptive radiation. *P Roy Soc B* 278:613-618
- **Ingram T, Stutz WE, Bolnick DI** (2011) Does intraspecific size variation in a predator affect its diet diversity and top-down control of prey? *PLoS ONE* 6:e20782
- **James DE, Chapus C, Gondo Y, Clayton DF, Sinha S, Blatti CA, Organ CL, Fujita MK, Balakrishnan CN, Edwards SV** (2011) Reptiles and mammals have differentially retained long conserved non-coding sequences from the amniote ancestor. *Genome Biol Evol* 3:102-113
- **James DE, Valenzuela N, Ezaz T, Amemiya C, Edwards SV** (2011) Sex chromosome evolution in amniotes: Applications for Bacterial Artificial Chromosome libraries. *J Biomed Biotechnol* 2011:132975
- **Kawauchi GY, Giribet G** (2011) On the ampho-Atlantic *Siphonaria pectinata* (Linnaeus, 1758) (Gastropoda: Heterobranchia: Siphonariidae): invader from the East or endemic? *J Mollus Stud* 77:196-201
- **Kerney RR, Blackburn DC, Müller H, Hanken J** (2011) Do larval traits re-evolve? Evidence from the embryogenesis of a direct-developing salamander, *Plethodon cinereus*. *Evolution* 66:252-262
- **Kolbe JJ, Revell LJ, Székely B, Brodie III ED, Losos JB** (2011) Convergent evolution of phenotypic integration and its alignment with morphological diversification in Caribbean *Anolis* ecomorphs. *Evolution* 65:3608-3624
- **Kosztolányi A, Barta Z, Küpper C, Székely T** (2011) Persistence of an extreme male-biased adult sex ratio in a natural population of polyandrous bird. *J Evol Biol* 24:1842-1846
- **Kronauer DJC, O'Donnell S, Boomsma JJ, Pierce NE** (2011) Strict monandry in the ponerine army ant genus *Simopelta* suggests that colony size and complexity drive mating system evolution in social insects. *Mol Ecol* 20:420-428
- **Kronauer DJC, Pierce NE** (2011) Myrmecophiles. *Curr Biol* 21:208-209
- **Kronauer DJC, Boomsma JJ, Pierce NE** (2011) Nine novel microsatellite markers for the army ant *Simopelta pygmaea* (subfamily Ponerinae). *Cons Gen Res* 3:61-63
- **Küpper C, Aguilar E, Gonzalez O** (2011) Notas sobre la ecología reproductiva y conservación de los chorlos nevados *Chondestes nivosus occidentalis* en Paracas, Perú. *Revista Peruana de Biología* 18:91-96
- **Kusumi K, Kulathinal RJ, Abzhonov A, Boissinot S, Crawford NG, Faircloth BC, Glenn TC, James DE, Losos JB, Menke DB, Poe S, Sanger TJ, Schneider C, Stapley J, Wilson-Rawls J** (2011) Developing a community-based genetic nomenclature for anole lizards. *BMC Genomics* 12:1471-2164
- **Lauder GV** (2011) Swimming hydrodynamics: ten questions and the technical approaches needed to resolve them. *Exp Fluids* 51:23-35
- **Lauder GV, Lim J, Shelton R, Witt C, Anderson EJ, Tangorra, J** (2011) Robotic models for studying undulatory locomotion in fishes. *Mar Technol Soc J* 45:41-55
- **Lauder GV, Madden PGA, Tangorra J, Anderson E, Baker TV** (2011) Bioinspiration from fish for smart material design and function. *Smart Mater Struct* 20:094014
- **Lawson LP, Zimkus BM** (2011) Range extension of *Phrynobatrachus sulfureogularis* (Anura, Phrynobatrachidae) from Burudi to the Mahale Mountains of Western Tanzania with a redescription of the species. *Fieldiana: Life and Earth Sciences* 4:112-116
- **Lee DV, Bertram JE, Anttonen JT, Ros IG, Harris SL, Biewener AA** (2011) A collisional perspective on quadrupedal gait dynamics. *J Roy Soc Interface* 8:1480-1486
- **Lopardo L, Giribet G, Hormiga G** (2011) Morphology to the rescue: Molecular data and the signal of morphological characters in combined phylogenetic analyses—a case study from mysminid spiders (Araneae, Mysminidae), with comments on the evolution of web architecture. *Cladistics* 27:278-330
- **Losos JB** (2011) Detective work in the West Indies: Integrating historical and experimental approaches to study the evolutionary diversification of island lizards. In *In the Light of Evolution: Essays from the Laboratory and Field* (Losos JB, ed) 73-92. Roberts and Co: Greenwood Village, CO (revised)
- **Losos JB** (2011) Nothing in biology makes sense except in the light of evolution: pattern, process, and the evidence. In *The Harvard Sampler: Liberal Education for the Twenty-First Century* (Shephard JM, Kosslyn SM, Hammonds EM, eds) 91-126. Harvard University Press: Cambridge, MA
- **Losos JB** (2011) Seeing the forest for the trees: the limitations of phylogenies in comparative biology. *Am Nat* 177:709-727
- **Losos JB** (2011) Convergence, adaptation, and constraint. *Evolution* 65:1827-1840
- **Losos JB, Pringle RM** (2011) Competition, predation and natural selection in island lizards. *Nature* 475:E1-2
- **Lucinda PHF, Figueirido CA, Hartel KE** (2011) Designation of the lectotype of *Poecilia amazonica* Garman, 1895 (Cyprinodontiformes, Poeciliidae) and discussion of its nomenclatural status. *Zootaxa* 2751:63-64
- **Manceau M, Domingues VS, Mallarino R, Hoekstra HE** (2011) The developmental role of Agouti in color pattern evolution. *Science* 331:1062-1065
- **Muriénne J, Edgecombe GD, Giribet G** (2011) Comparative phylogeography of the centipedes *Cryptops pictus* and *C. niuensis* in New Caledonia, Fiji and Vanuatu. *Org Divers Evol* 11:61-74
- **Novo M, Almodóvar A, Fernández R, Giribet G, Díaz-Cosin DJ** (2011) Understanding the biogeography of a group of earthworms in the Mediterranean basin—The phylogenetic puzzle of Hormogastridae (Clitellata: Oligochaeta). *Mol Phylog Evol* 61:125-135
- **Organ CL, Edwards SV** (2011) Major events in avian genome evolution. In *Living Dinosaurs: The Evolutionary History of Modern Birds* (Dyke G, Kaiser G, eds) 325-337. Wiley-Blackwell: United Kingdom
- **Oufiero CF, Gartner GEA, Adolph SC, Garland Jr. T** (2011) Latitudinal and climatic variation in body size and dorsal



scale counts in *Sceloporus* lizards: a phylogenetic perspective. *Evolution* 65:3590-3607

• Parenti LR, Hartel KE (2011) Osteology identifies *Fundulus nigrus* Garman, 1895 as a killifish in the family Fundulidae (Atherinomorpha: Cyprinodontidae). *Copeia* 2011:242-250

• Rabeling C, Gonzales O, Schultz TR, Bacci M, Garcia MVB, Verhaagh M, Ishak HD, Mueller UG (2011) Cryptic sexual populations account for genetic diversity and ecological success in a widely distributed, asexual fungus-growing ant. *P.Natl.Acad.Sci.USA* 108:12366-12371

• Ramakrishnan S, Bozkurtas M, Mittal R, Lauder GV (2011) Thrust production in highly flexible pectoral fins: a computational dissection. *Mar Technol Soc J* 45:56-64

• Ramirez SR, Eltz T, Fujiwara MK, Gerlach G, Goldman-Huertas B, Tsutsumi ND, Pierce NE (2011) Asynchronous diversification in a specialized plant-pollinator mutualism. *Science* 333:1742-1746

• Rheindt F, Edwards SV (2011) Genetic introgression: an integral but neglected component of speciation in birds. *Auk* 128:620-632

• Rheindt FE, Székely T, Edwards SV, Lee PLM, Burke T, Kennerley PR, Bakewell DN, et al (2011) Conflict between genetic and phenotypic differentiation: the evolutionary history of a 'lost and rediscovered' shorebird. *PLoS ONE* 6:e26095

• Rinaldo C, Warnement J, Baione T, Kalfatovic MR, Fraser S (2011) Retooling special collections digitisation in the age of mass scanning. *Arndine* 67

• Ros IG, Bassman LC, Badger MA, Pierson AN, Biewener AA (2011) Pigeons steer like helicopters and generate down and upstroke lift during low speed turns. *P.Natl.Acad.Sci.USA* 108:19990-19995

• Rykken JJ, Jepson PC, Moldenke AR (2011) Ground-dwelling arthropod distribution and movement across a fragmented riparian forest. *Northwest Sci* 85:527-541

• Sanger TJ, Revell LJ, Gibson-Brown JJ, Losos JB (2011) Repeated modification of early limb morphogenesis programs underlies the evolution of relative long bone length variation among *Anolis* lizards. *P.Roy.Soc.B* 279:739-748

• Sanger TJ, Norgard EA, Pletscher LS, Bevilacqua M, Brooks VR, Cheverud JM (2011) Developmental and genetic origins of murine long bone length variation. *JExp.Zool B* 316:146-161

• Sears MAB, Woollacott RM (2011) Reverend William F. Lynch: A life in science and education. In *Annals of Bryozoology 3: aspects of the history of research on bryozoans* (Wyse Jackson P, Spencer Jones M, eds) 99-122. International Bryozoology Association, Trinity College: Dublin, Ireland

• Sharma PP, Giribet G (2011) The evolutionary and biogeographic history of the armoured harvestmen—Laniatores phylogeny based on ten molecular markers, with the description of two new families of Opiliones (Arachnida). *Invertebr Syst* 25:106-142

• Sharma PP, Kurv AB, Giribet G (2011) The Zalmoxidae (Arachnida: Opiliones: Laniatores) of the Palearctic: a catalogue of Southeast Asian and Indo-Pacific species. *Zootaxa* 2972:37-58

• Sharma PP, Prieto CE, Giribet G (2011) A new family of Laniatores (Arachnida: Opiliones) from the Afrotropics. *Invertebr Syst* 25:143-154

• Sharma PP, Vahtra V, Kawachi GY, Giribet G (2011) Running wild: the case for exploring mixed parameter sets in sensitivity analysis. *Cladistics* 27:538-549

• Smith S, Wilson NG, Goetz F, Feehery C, Andrade SCS, Rouse GW, Giribet G, Dunn CW (2011) Resolving the evolutionary relationships of molluscs with phylogenomic tools. *Nature* 480:364-367

• Sprague J, Zimkus BM (2011) Description of the tadpole of *Amphiprotus trilineatus* (Anura: Bufonidae) from the West Usambara Mountains, Tanzania. *Arch Herpetol Zool* 7:477

• Storz JF, Hoffmann FG, Opaz JC, Sanger TJ, Moorman H (2011) Developmental regulation of hemoglobin synthesis in the anole lizard *Anolis aeneus*. *JExp.Biol* 214:575-581

• Tangorra J, Gencke T, Lauder G (2011) Learning from the fins of ray-finned fishes for the propulsion of autonomous undersea vehicles. *Mar Technol Soc J* 45:65-73

• Tangorra J, Phelan C, Esposito C, Lauder G (2011) Use of biorobotic models of highly deformable fins for studying the mechanics and control of fin forces in fishes. *Integr Comp Biol* 51:176-189

• Ugelvig LV, Vila R, Pierce NE, Nash DR (2011) A phylogenetic revision of the *Glaucopsyche* section (Lepidoptera: Lycaenidae), with special focus on the *Phlegon/Mandana* clade. *Mol Phylog Evol* 61:237-243

• Vila R, Bell CD, Macniven R, Goldman-Huertas B, Ree RH, Marshall CR, Bálint Z, Johnson K, Benaventi D, Pierce NE (2011) Phylogeny and palaeoecology of *Polyommatus* blue butterflies show Beringia was a climate-regulated gateway to the New World. *P.Roy.Soc.B* 278:2737-2744

• Vo ATE, Bank MS, Shme JP, Edwards SV (2011) Temporal increase in organic mercury in an endangered pelagic seabird assessed via century-old museum specimens. *P.Natl.Acad.Sci.USA* 108:7466-7471

• Wang JJ (2011) Inversely related aposematic traits: reduced conspicuousness evolves with increased toxicity in a polymorphic poison-dart frog. *Evolution* 65:1637-1649

• Wang JJ (2011) Choosing appropriate markers and analytical methods for testing landscape genetic hypotheses. *Mol Ecol* 20:2484-2482

• Wang JJ, Johnson JR, Johnson BB, Shaffer HB (2011) Effective population size is strongly correlated with breeding pond size in the endangered California tiger salamander, *Ambystoma californiense*. *Cons Genet* 12:911-920

• Whiteman NK, Groen SC, Chevasco D, Bear A, Beckwith N, Gregory TR, Denoux C, Mammarella N, Ausubel F, Pierce NE (2011) Mining the plant-herbivore interface with a leafmining *Drosophila* of *Arabidopsis*. *Mol Ecol* 20:995-1014

• Wilkinson M, San Mauro D, Sherratt E, Gower DJ (2011) A nine-family classification of caecilians (Amphibia: Gymnophiona). *Zootaxa* 287:41-64

• Ziegler A, Kunth M, Mueller S, Bock C, Pohmann R, Schröder L, Faber C, Giribet G (2011) Application of magnetic resonance imaging in zoology. *Zoomorphology* 130:227-254

• Ziermann JM, Infante C, Hanken J, Olsson L (2011) Morphology of the cranial skeleton and musculature in the obligate carnivorous tadpole of *Lepidobatrachus laevis* (Anura: Ceratophryidae). *Acta Zool-Stockholm* 00:1-12

• Zimkus BM, Ford LS (2011) Developing best practices for genetic resource collections associated with traditional natural history collections. *SPNHC Newsletter* 25:20-21

• Zimkus BM, Larson JG (2011) Examination of the molecular relationships of sand frogs (Anura: Pseudophyllidae, *Tympanophorus*) and resurrection of two species from the Horn of Africa. *Zootaxa* 2933:27-45



Roger Vila, Benjamin Goldman-Huertas, Naomi E. Pierce, Charles Marshall and colleagues contributed "Phylogeny and palaeoecology of *Polyommatus* blue butterflies show Beringia was a climate-regulated gateway to the New World" as the cover story of *Proceedings of the Royal Society B*. It was one of the publication's 10 most downloaded articles of 2011.



For the cover story of *Journal of the Royal Society Interface*, George V. Lauder and colleagues published "Aquatic maneuvering with counter-propagating waves: a novel locomotive strategy".



MCZ GRANT RECIPIENTS

ACADEMIC YEAR 2011–2012

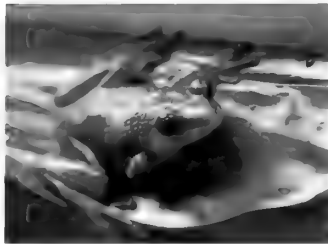
Grants-In-Aid of Undergraduate Research (GUR)

These grants support research by Harvard undergraduates under faculty supervision. Priority is given to projects that utilize MCZ and Harvard University Herbaria (HUH) research collections, laboratories and facilities. Support for these grants comes from the MCZ's Myvanwy M. and George M. Dick Scholarship for Students and from HUH.

Recipient	Faculty Sponsor/ Academic Dept.	Project Title	Amount
Nicholas F. Brazeau	Zarin Machanda/ Human Evolutionary Biology	The effects of small-scale habitat heterogeneity on chimpanzee growth and body size	\$2,500
Alexander M. Kim	Gonzalo Giribet/ Organismic and Evolutionary Biology	From the Gulf of Guinea to the bridge of the world: transoceanic dispersal and human- mediated invasion in two pantropical genera of freshwater prawns	\$2,047
Young Mi Kwon	Hopi E. Hoekstra/ Organismic and Evolutionary Biology	Paternal care of promiscuous <i>Peromyscus maniculatus</i> and monogamous <i>Peromyscus polionotus</i>	\$1,925
Bianca M. Lec	Scott V. Edwards/ Organismic and Evolutionary Biology	The nose knows? Exploring the possibility of MHC-informed mate choice in a petrel	\$2,500
Bonnie R. Lei	Scott V. Edwards/ Organismic and Evolutionary Biology	Multilocus phylogeography of the hairy woodpecker, <i>Picoides villosus</i> , in North America	\$1,151
Amanda J. Lu	Scott V. Edwards/ Organismic and Evolutionary Biology	Recent changes in the genome of pathogen <i>Mycoplasma gallisepticum</i> in house finches	\$2,293
Linda Y. Pan	Hopi E. Hoekstra/ Organismic and Evolutionary Biology	The effects of cross-fostering on burrowing behavior ontogeny in deer mice (<i>Peromyscus</i>)	\$2,060
Lauren L. Tomkinson	Naomi E. Pierce/ Organismic and Evolutionary Biology	Genetic and environmental effects on the social structure of the native pollinator, <i>Augochlorella aurata</i>	\$2,100
Anna R. Veverica	Elena M. Kramer/ Organismic and Evolutionary Biology	Investigation of leaf morphology and development of transgenics in <i>Aquilegia</i>	\$2,500
Olivia G. Weeks	Arhat Abzhanov/ Organismic and Evolutionary Biology	The molecular basis of dental development in the American alligator	\$1,700
		Total Awards	\$20,776



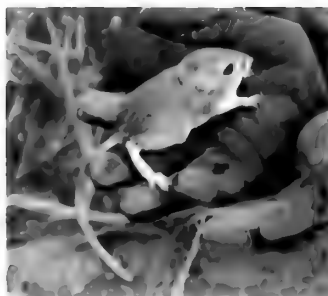
Thomas Dan



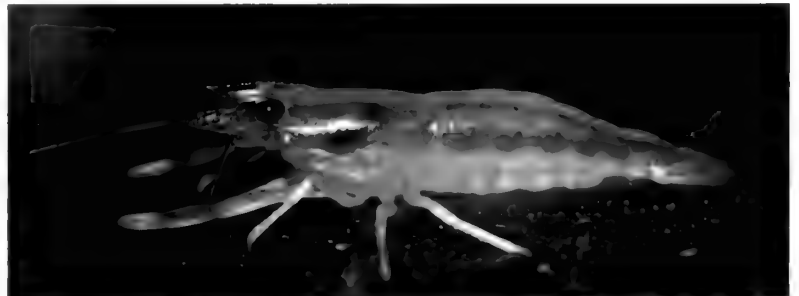
Bretta Zinkus



Zachary



Olivia G. Weeks



Alexander M. Kim



Putnam Expedition Grants

Putnam Expedition Grants are intended to support MCZ faculty-curators, postdoctoral fellows and graduate students in collecting specimens and data relating to the study of comparative zoology. Priority is given to projects that collect living specimens in regions where habitats are threatened or fossil specimens in regions most likely to hold important clues for unraveling evolutionary strategies. These grants are made possible by a gift from Mr. and Mrs. George Putnam, Jr., '49.

Recipient	MCZ Department	Project Title	Amount
Christopher C.M. Baker, Jack H. Boyle and Naomi E. Pierce	Entomology	Population genetics and ecology of African acacia ants	\$8,749
Rowan D.H. Barrett	Mammalogy	Selection on genes in the wild	\$14,350
Shane C. Campbell-Staton	Herpetology	Physiological divergence within <i>Anolis carolinensis</i> : an emerging reptile model	\$9,088
James D. Crall	Entomology	Orchid bee movement in heterogeneous environments	\$2,300
Vanessa L. Gonzalez	Invertebrate Zoology	Collecting Archiheterodonta (Bivalvia: Heterodonta) in South Africa for resolving familial relationships within this group	\$7,000
Christopher E. Laumer	Invertebrate Zoology	Surveying the diversity of prorhynchid flatworms in temperate rainforests of the Pacific northwest	\$6,244
Marie Manceau	Mammalogy	Pigment pattern evolution in beach mice	\$3,230
Frank E. Rheindt	Ornithology	Collection of a new genus of tanager (Aves)	\$2,230
Christian Rabeling	Entomology	The ants of Vanuatu: exploring the evolutionary ecology of an unknown island fauna	\$15,610
Thomas J. Sanger	Herpetology	Why the long face? Field studies of the Crooked Island anole, <i>Anolis brunneus</i>	\$5,140
Total Awards			\$73,941



Breda Zinkus



Breda Zinkus



Rowan Barrett



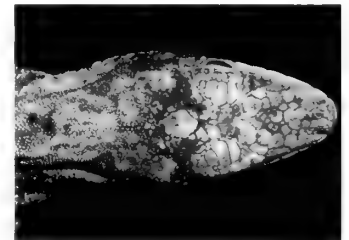


Ernst Mayr Travel Grants in Animal Systematics

Ernst Mayr Grants support travel for research in animal systematics and are open to the scientific community worldwide. The principal objective of these grants is to stimulate taxonomic work on neglected taxa and/or poorly described species. Ernst Mayr Grants typically facilitate visits to institutional collections, with preference given to research that uses MCZ's collections. These grants are made possible by a gift from Professor and former MCZ Director Ernst Mayr.

Recipient	Institutional Affiliation	Project Title	Amount
Brad J. Balukjian	University of California, Berkeley	Using integrative taxonomy to revise the radiation of <i>Pseudoloxops</i> Kirkaldy (Heteroptera: Miridae) plant bugs from French Polynesia	\$1,500
Diego Nunes Barbosa	Universidade Federal do Espírito Santo	Type analysis of the world <i>Mesitinae</i> (Hymenoptera: Bethyidae)	\$1,500
Cristian F. Beza-Beza	Wichita State University	Revision of the <i>Petrejoides orizabe</i> species group (Coleoptera: Passalidae)	\$1,500
Marek L. Borowiec	University of California, Davis	Generic revision of dorylomorph ants (Hymenoptera: Formicidae)	\$1,220
Jimmy J. Cabra	São Paulo University, Instituto de Biociências	Revision and cladistics analysis of the orbweaving spider genus <i>Glenognatha</i> Simon, 1887 (Araneae, Tetragnathidae)	\$1,500
Chenyang Cai	Nanjing Institute of Geology and Paleontology, Chinese Academy of Sciences	Taxonomic study on the Mesozoic Staphylinoidea beetles (Coleoptera) from China	\$1,300
Andrew R. Cline	California Department of Food and Agriculture; University of California, Davis	Diversification of sap beetles (Coleoptera: Nitidulidae) in the neotropics: taking steps to unravel Darwin's conundrum	\$1,460
Yingying Cui	Capital Normal University, China	Investigation of intra-specific variability in selected Permian Grylloblattida from Carpenter's collection	\$1,500
Liza E. Gomez Daglio	University of California, Merced	Hidden diversity of scyphozoan jellyfish	\$1,450
Nataliya Dnestrovskaya (Paraketsova)	Moscow State University	Studies of polychaetous family Nephtyidae from the collection at the Museum of Comparative Zoology	\$1,500
Regaine Saturnino Ferreira	Universidade Federal de Pará, Museu Paraense Emílio Goeldi	Petrunkewitch collection: Examination of clubionids from Yale Peabody Museum of Natural History, New Haven	\$998
Georg Fischer	California Academy of Sciences	Taxonomy of Malagasy <i>Pheidole</i>	\$845
Lucja A. Fostowicz-Freluk	American Museum of Natural History	Taxonomic revision of a basal lagomorph, <i>Palaeolagus</i> (Mammalia, Glires)	\$750
Traci L. Grzymala	University of California, Berkeley	Taxonomy and systematics of the Aderidae (Coleoptera: Tenebrionidae)	\$1,333
Francisco Hita Garcia	California Academy of Sciences	Taxonomic revision of the proceratiine genera <i>Discothyrea</i> Roger, <i>Proceratium</i> Roger, and <i>Probolomyrmex</i> Mayr in the Malagasy zoogeographical region	\$1,430
Ana Jesovnik	University of Maryland; Smithsonian Institution	Taxonomic revision of the fungus-growing ant genus <i>Sericomyrmex</i>	\$1,285
Gunther Köhler	Senckenberg Research Institute	<i>Anolis</i> of Panama	\$1,500

Recipient	Institutional Affiliation	Project Title	Amount
Nathan P. Lord	The University of New Mexico	Revisionary systematics on the hyperdiverse southern hemisphere Zopheridae (Coleoptera: Tenebrionidae)	\$1,500
Stephanie F. Loria	Richard Gilder Graduate School, American Museum of Natural History	Revision of the scorpion family Chaerilidae Pocock, 1893	\$1,500
Pablo Ricardo Mulieri	National Council of Scientific and Technical Research (CONICET)	Systematics of Sarcophaginae (Diptera: Sarcophagidae): study of genera present in southern South America	\$1,500
Maria del Mar Soler Hurtado	Universidade de Sevilla, Spain	Taxonomic revision of the eastern Pacific Gorgoniidae deposited in the Museum of Comparative Zoology	\$1,500
Michael G. Reuscher	Texas A&M University, Corpus Christi	A review of the taxonomy of Paraonidae (Annelida: Polychaeta) based on the examination of type material	\$1,500
Eric N. Rittmeyer	Louisiana State University	Fine scale diversification in a biodiversity hotspot: systematics of the <i>Tribolonotus pseudoponceleti</i> complex	\$1,000
Cecilia Waichert	Utah State University	Systematics of Ateniellini (Hymenoptera: Pompilidae)	\$1,500
Total Awards			\$32,571



Gaetano Köhler

Miyata Grants

Miyata Grants are intended to enable herpetological fieldwork by MCZ graduate students and postdoctoral fellows. Non-herpetological fieldwork may be eligible when there are no deserving herpetological projects.

The Ken Miyata Fund for Field Research Award is made possible by a gift from Dr. Barbara Jil'Wu, Ph.D. '81, and Mr. Eric Larson, A.B. '77.			
Recipient	MCZ Department	Project Title	Amount
Ambika Kamath	Herpetology	Correlates of variation in dewlap color and pattern in the fan-throated lizard, <i>Sitana ponticeriana</i> (Squamata: Agamidae)	\$1,485
Zachary Lewis	Herpetology	Field trip to collect <i>Hemidactylium scutatum</i> embryos on Cape Cod	\$927
Martha Muñoz	Herpetology	Did Ernest Williams get it right? Testing the idea that behavior simultaneously impels and impedes evolution in <i>Anolis cybotes</i> (Squamata: Iguanidae)	\$9,110



Zach Lewis



Ambika Kamath

The Kenneth Miyata Endowment Fund in Herpetology was established in memory of Kenneth Miyata, Ph.D. 1980, and is made possible by gifts from Ken's friends and colleagues.			
Recipient	MCZ Department	Project Title	Amount
Alexis Harrison	Herpetology	Impact of ornaments on evolution of the neotropical lizard genus <i>Anolis</i>	\$5,000
Travis Ingram	Herpetology	A field study assessing the role of intraguild predation in interspecific interactions between <i>Anolis</i> lizards	\$5,210
Total Awards			\$21,732



AWARDS & RECOGNITION



Catherine Weisel

A.W. "Fuzz" Crompton

Emeritus

A.W. "Fuzz" Crompton was awarded the 2011 Romer-Simpson Medal of the Society of Vertebrate Paleontology. The society's highest award honors sustained and outstanding scholarly excellence in the discipline of vertebrate paleontology.

Edward O. Wilson received the 2012 International Cosmos Prize. The prize is awarded to individuals whose research has achieved excellence and is

recognized as contributing to a significant understanding of the relationships among living organisms.

Faculty

Scott Edwards was elected President of the Society for the Study of Evolution.

Gonzalo Giribet was elected a Fellow of the California Academy of Sciences and President of the Willi Hennig Society, and appointed as a Research Associate at the Field Museum of Natural History. Giribet also received a National Geographic Expeditions award for research in Amazonia.

Hopi Hoekstra received the 2011 Fannie Cox Prize for Excellence in Science Teaching. The award recognizes faculty who inspire students, instill in them a passion for science and effectively communicate complex ideas in introductory science courses.

Jonathan Losos received the Daniel Giraud Elliot Medal from the National Academy of Sciences in recognition of his research on adaptive radiation of *Anolis* lizards. Losos was also elected as a member of the American Academy of Arts and Sciences. The blog *Anole Annals*, edited by Losos and Rich Glor of the University of Rochester, was named "Blog of the Week" by *Scientific American*. www.anoleannals.org

Naomi Pierce was elected as an Honorary Fellow of the Royal Entomological Society.

Staff

Adam Baldinger, Curatorial Associate in Invertebrate Zoology, Malacology & Marine Invertebrates, received a 2011 Impact Award for his sustained, superior performance and exceptional effectiveness in the Faculty of Arts and Sciences (FAS).

Alison Pirie, Faculty & Collections Assistant in Mammalogy and Ornithology, received the Dean's Distinction Award, which recognizes outstanding citizenship and exceptional contributions in support of the FAS mission.

Dana Fisher, Assistant to the Librarian and Special Collections, and **Mary Sears**, Head of Public Services, both in the Ernst Mayr Library, were each honored in a December 2011 ceremony for 25 years of service to Harvard University.

Postdocs

Rowan Barrett was recognized with the John Maynard Smith Prize from the European Society for Evolutionary Biology for his work on the genetics of adaptation to changing environments. He also received the Young Investigators Award from the American Society of Naturalists, the Natural Sciences and Engineering Research Council Banting Fellowship, the Human Frontiers in Science Postdoctoral Fellowship and the National Geographic Research and Exploration Grant.

Andres Bendesky received the Helen Hay Whitney Postdoctoral Fellowship for his work involving the neurobiology and genetics of pair-bonding behavior in *Peromyscus* mice.

Jean-Marc Lassance was given The Human Frontiers in Science Postdoctoral Fellowship, which encourages early career scientists to broaden their research skills by moving into new areas of study while working in a new country. Lassance also received a postdoctoral fellowship from EMBO in support of international research careers.

Marie Manceau received the ATIP-Avenir Starting Grant from the Institut National de la Sante et de la Recherche Medicale and the Centre National pour la Recherche Scientifique (CNRS). The grant enables young scientists to create and lead a team within an established laboratory in France.



Catherine Weisel

Adam Baldinger



Catherine Weisel

Elizabeth Sefton



Naomi Pierce

Naomi Pierce



Sarah Kocher received a USDA Postdoctoral Fellowship to study pollination biology of native bees.

Graduate Students

Elizabeth Sefton received the Derek C. Bok Award for Excellence in Graduate Student Teaching of Undergraduates. **Chris Laumer** is the winner of the Best Platform Presentation for his talk at the 2012 Society for Integrative & Comparative Biology Division of Phylogenetics and Comparative Biology (SICB DPCB) meeting.



Prashant Sharma

Prashant Sharma was declared the runner-up for his talk at the SICB DPCB meeting. Sharma also received a Certificate of Teaching Excellence from the Harvard Derek Bok Center, a National Science Foundation Postdoctoral Research Fellowship in Biology (PRFB) grant for research at the American Museum of Natural History and teaching at the City University of New York, and the Deakin-Royce Fellowship from the Australian Studies Committee for fieldwork in Queensland and Northern Territory, Australia.

The following graduate students received NSF Doctoral Dissertation Improvement Grants: **Alexis Harrison**, **Emily Jacobs-Palmer**, **Hillery Metz** and **Martha Muñoz**. In addition, Metz received the Robert A. Chapman Memorial Scholarship from Harvard and Muñoz received a Sigma Xi Grant-In-Aid of Research. **Katie Boronow**, **James Crall** and **Kara Feilich** were given NSF Graduate Research Fellowships. **Nicole Bedford** received a James Mills Peirce Fellowship and a NSERC Postgraduate Scholarship. **Ambika Kamath** was given the Rufus B. Kellogg Fellowship from Amherst College. **Evan Kingsley** received the Merit Graduate Society Term-time Research Fellowship and Robert A. Chapman Memorial Scholarship from Harvard.



Alison Piru

Great Transformations: Major Events in the History of Vertebrate Life



In June, **Farish A. Jenkins** was honored in a symposium at the MCZ organized by Prof. Beth Brainerd (Brown University), Prof. Kenneth Dial (The University of Montana) and Prof. Neil Shubin (University of Chicago).

The event, celebrating his 44-year career as a mentor, teacher and friend, included 19 presentations by Jenkins's former students, lab members and colleagues. The presentations focused on themes consistent with his lifelong research in paleontology and functional morphology of transitional forms among major vertebrate clades.

Dial, a former postdoc in Jenkins's lab, explains, "Farish's profound impact on the lives and careers of countless students, post-doctoral fellows and research collaborators is acknowledged worldwide. His lectures are legendary, his teaching voice always articulate, passionate, focused and organized. Through his example, Farish's colleagues have been shown the standard bar to the highest quality of teaching and research." The papers will be integrated into chapters of an edited text in Jenkins's honor.

Kris Shubin



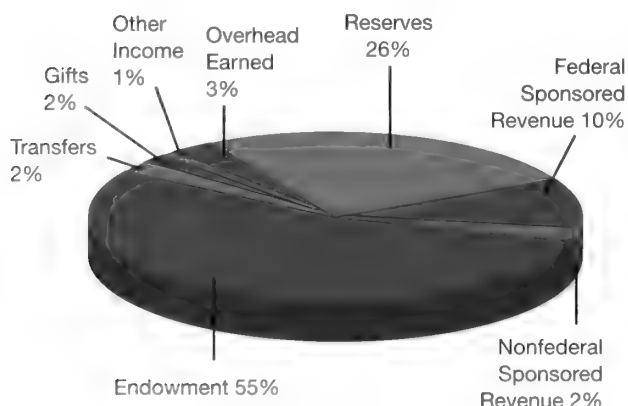
FINANCIAL DATA

These charts describe the income and expenses of the Museum of Comparative Zoology in fiscal year 2012.

Endowment income funds much of the Museum's activities, including acquisition and maintenance of collections, faculty and staff salaries, capital projects, facilities renovation and maintenance. Included in **Endowment** income is the annual distribution, revenue generated from assets purchased through endowments and endowed funds decapitalized per donor request. **Transfers** include Harvard University-funded faculty research, financial support for the Ernst Mayr Library and other Harvard-funded projects. **Other Income** comprises miscellaneous income from publication subscriptions, royalties, sales and fees, and other cost recovery from other MCZ-sponsored activities. **Reserves** represent the amount of carry-forward balances used to cover an operating deficit. **Overhead** is funding paid from MCZ-based sponsored projects to the MCZ to cover facilities and administrative costs for

those projects. It is shown as both income (**Overhead Earned**) and expenses (**Overhead Charged**). **Capital Projects** include deployment of collections to the newly constructed space in the Northwest Building. Building expenses such as maintenance, facility improvements and utilities are captured in the **Space & Occupancy** category. **Operating Expenses** consist of equipment purchases, supplies, consultant and conference fees, as well as annual subventions to the Department of Organismic and Evolutionary Biology (OEB) for administrative services. Support for MCZ-affiliated graduate students in OEB is included in **Scholarships, Awards & Travel**. **Institutional Expenses** are support for other University activities outside the MCZ, including the Faculty of Arts and Sciences, University initiatives and general operating support to the Harvard Museum of Natural History.

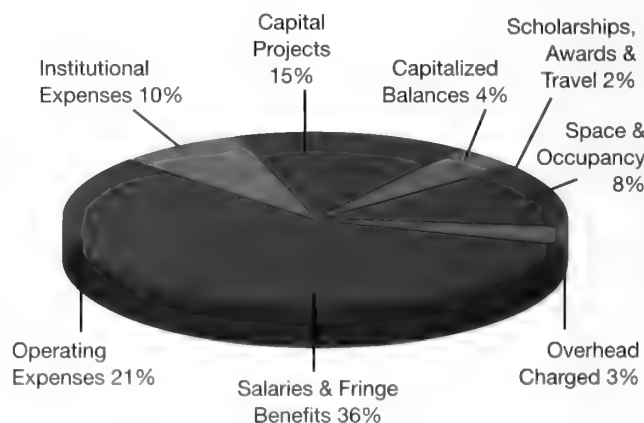
Income



Income

Endowment	\$13,370,363
Reserves	\$6,249,189
Federal Sponsored Revenue	\$2,443,841
Overhead Earned	\$780,190
Transfers	\$436,801
Gifts	\$378,917
Nonfederal Sponsored Revenue	\$370,390
Other Income	\$150,946
Total	\$24,180,637

Expenses



Expenses

Salaries & Fringe Benefits	\$8,677,650
Operating Expenses	\$5,185,591
Capital Projects	\$3,733,150
Institutional Expenses	\$2,465,668
Space & Occupancy	\$1,905,562
Capitalized Balances	\$968,397
Overhead Charged (Sponsored)	\$779,987
Scholarships, Awards & Travel	\$464,632
Total	\$24,180,637



Faculty-Curators

Andrew A. Biewener
Charles P. Lyman Professor of Biology;
Director, Concord Field Station

Scott V. Edwards
Professor of Organismic and
Evolutionary Biology; Alexander
Agassiz Professor of Zoology; Curator of
Ornithology

Brian D. Farrell
Professor of Biology; Curator of
Entomology

Gonzalo Giribet
Professor of Organismic and
Evolutionary Biology; Curator of
Invertebrate Zoology

James Hanken
Professor of Biology; Alexander Agassiz
Professor of Zoology; Curator of
Herpetology; Director, MCZ

Hopi E. Hoekstra
Professor of Organismic and
Evolutionary Biology; Alexander
Agassiz Professor of Zoology; Curator of
Mammalogy

Farish A. Jenkins, Jr.
Professor of Biology; Harvard College
Professor; Alexander Agassiz Professor
of Zoology; Curator of Vertebrate
Paleontology

George V. Lauder
Professor of Biology; Henry Bryant
Bigelow Professor of Ichthyology; Curator
of Ichthyology

Jonathan B. Losos
Monique and Philip Lehner Professor
for the Study of Latin America; Curator
of Herpetology

James J. McCarthy
Professor of Biological Oceanography;
Alexander Agassiz Professor of Biological
Oceanography; Acting Curator of
Malacology

Naomi E. Pierce
Sidney A. and John H. Hessel Professor
of Biology; Curator of Entomology

Robert M. Woollacott
Professor of Biology; Curator of Marine
Invertebrates

Emeritus Faculty

Kenneth J. Boss
Faculty-Curator, Emeritus;
Professor of Biology, Emeritus

A.W. "Fuzz" Crompton
Faculty-Curator, Emeritus; Fisher
Professor of Natural History, Emeritus

Herbert W. Levi
Faculty-Curator, Emeritus; Alexander
Agassiz Professor of Zoology, Emeritus

Richard C. Lewontin
Professor of Biology, Emeritus;
Alexander Agassiz Professor of Zoology,
Emeritus

Edward O. Wilson
Honorary Curator in Entomology;
Pellegrino University Professor, Emeritus

**Postdoctoral Fellows,
Research Associates
& Visiting Scholars**

Allison Arnold-Rife
Concord Field Station, Biewener Lab

Niclas Backström
Ornithology, Edwards Lab

Rowan D. H. Barrett
Mammalogy, Hoekstra Lab

Andres Bendesky
Mammalogy, Hoekstra Lab

María del Rosario Castañeda
Herpetology, Losos Lab

Gilberto Neves Bento
Mammalogy, Hoekstra Lab

Savel Daniels
Invertebrate Zoology, Giribet Lab

Vera Domingues
Mammalogy, Hoekstra Lab

Rodney Eastwood
Entomology, Pierce Lab

Marianne Espeland
Entomology, Pierce Lab

Heidi Fisher
Mammalogy, Hoekstra Lab

Brooke Flammang
Ichthyology, Lauder Lab

Adam Freedman
Herpetology & Mammalogy, Losos &
Hoekstra Labs

Matthew Fujita
Ornithology, Edwards Lab

Gabriel Gartner
Herpetology, Losos Lab

Natalie Holt
Concord Field Station, Biewener Lab

Guo-hua Huang
Entomology, Pierce Lab

Travis Ingram
Herpetology, Losos Lab

Milan Janda
Entomology, Pierce Lab

Gisele Kawauchi
Invertebrate Zoology, Giribet Lab

Christopher Kenaley
Ichthyology, Lauder Lab

Julia Klaczko
Herpetology, Losos Lab

Sarah Kocher
Entomology, Pierce Lab

Clemens Küpper
Ornithology, Edwards Lab

Jean-Marc Lassance
Mammalogy, Hoekstra Lab

Matthew Lim
Entomology, Pierce Lab

Mark Liu
Ornithology, Edwards Lab

David Lubertazzi
Global Ant Project, Wilson Lab

Hillary Maddin
Herpetology, Hanken Lab

Ricardo Mallarino
Mammalogy, Hoekstra Lab

Marie M. Manceau
Mammalogy, Hoekstra Lab

Maria de Boef Miara
Concord Field Station, Biewener Lab

Gabriel Miller
Entomology, Pierce Lab

Brant Peterson
Mammalogy, Hoekstra Lab

Nadine Piekarski
Herpetology, Hanken Lab

Yu-Ping Poh
Mammalogy, Hoekstra Lab

Christian Rabeling
Entomology, Pierce Lab

Frank Rheindt
Ornithology, Edwards Lab

Ana Riesgo
Invertebrate Zoology, Giribet Lab

Alicia Rodriguez Perez-Porro
Invertebrate Zoology, Giribet Lab

Thomas Sanger
Herpetology, Losos Lab

Emma Sherratt
Herpetology, Losos Lab

Sebastian Velez
Invertebrate Zoology, Giribet Lab

Ian Wang
Herpetology, Losos Lab

Li Wen
Ichthyology, Lauder Lab

Alexander Ziegler
Invertebrate Zoology, Giribet Lab

Graduate Students

Christopher Baker
Entomology, Pierce Lab

Maude Baldwin
Ornithology, Edwards Lab

Leonora Bittleston
Entomology, Pierce Lab

Erin Blevins
Ichthyology, Lauder Lab

Katherine Boronow
Herpetology, Losos Lab

John Boyle
Entomology, Pierce Lab

Shane Campbell-Staton
Ornithology, Edwards Lab

Glenna Clifton
Concord Field Station, Biewener Lab

Mark Cornwall
Entomology, Pierce Lab

Amanda Evans
Entomology, Farrell Lab

Kara Feilich
Ichthyology, Lauder Lab

Vanessa Gonzalez
Invertebrate Zoology, Giribet Lab

Patrick Goring
Entomology, Farrell Lab

Alexis Harrison
Herpetology, Losos Lab

Emily Jacobs-Palmer
Mammalogy, Hoekstra Lab

Collin Johnson
Marine Invertebrates, Woollacott Lab

Zofia Kaliszewska
Entomology, Pierce Lab

Ambika Kamath
Herpetology, Losos Lab

Emily Kay
Mammalogy, Hoekstra Lab

Evan Kingsley
Mammalogy, Hoekstra Lab

Christopher Laumer
Invertebrate Zoology, Giribet Lab

Zachary Lewis
Herpetology, Hanken Lab

Jeanette Lim
Ichthyology, Lauder Lab

Luke Mahler
Herpetology, Losos Lab

Hillery Metz
Mammalogy, Hoekstra Lab

Talia Moore
Herpetology & Concord Field Station,
Losos & Biewener Labs

Martha Muñoz
Herpetology, Losos Lab

Ivo Ros
Concord Field Station, Biewener Lab

Elizabeth Sefton
Herpetology, Hanken Lab

Prashant Sharma
Invertebrate Zoology, Giribet Lab

Allison Shultz
Ornithology, Edwards Lab

Bruno Souza de Medeiros
Entomology, Farrell Lab

Yoel Stuart
Herpetology, Losos Lab

Wenfei Tong
Mammalogy, Hoekstra Lab

Jesse Weber
Mammalogy, Hoekstra Lab

Yunke Wu
Herpetology, Hanken Lab

Xuemail Zhai
Biological Oceanography,
McCarthy Lab

Associates

Bruce Archibald
Associate of Entomology
Simon Fraser University

Aaron Bauer
Associate of Herpetology
Villanova University

Reinier Beeuwkes, III
Associate of Zoology
Ischemix Company

MCZ PERSONNEL

Andrew Berry
Associate of Population Genetics
Harvard University

Elizabeth Brainerd
Associate of Ichthyology
Brown University

Donald S. Chandler
Associate of Entomology
University of New Hampshire

Jae Choe
Associate of Entomology
Ewha Womans University

Janet Collett
Associate of Population Genetics
University of Sussex

Bruce Collette
Associate of Ichthyology
National Marine Fisheries Service

David Bruce Conn
Associate of Invertebrate Zoology
Berry College

James Costa
Associate of Entomology
Western Carolina University

Catherine Craig
Associate of Invertebrate Zoology
Harvard University

Harlan Dean
Associate of Invertebrate Zoology
Harvard University

Lloyd Demetrius
Associate of Population Genetics
Harvard University

Philip DeVries
Associate of Entomology
University of New Orleans

Gregory D. Edgecombe
Associate of Invertebrate Zoology
Natural History Museum, England

Ben Evans
Associate of Herpetology
McMaster University

Richard Glor
Associate of Herpetology
University of Rochester

Kelvin A. Guetereo
Associate of Entomology
*Systematic Entomologist/
Environmental Consultant*

Michael Hadfield
Associate of Marine Biology
Kewalo Marine Laboratory

Anthony Hettel
Associate of Herpetology
*Muséum National d'Histoire
Naturelle, Paris*

Berthold Holldobler
Associate of Entomology
Arizona State University

Gustavo Hormiga
Associate of Invertebrate Zoology
George Washington University

Alan Kibat
Associate of Malacology
Attorneys, Bernabey & Wachtel

Leslie S. Kaufman
Associate of Ichthyology
Boston University

Timothy Laman
Associate of Ornithology
National Geographic

Ruth Hortencia Bastardo Landrau
Associate of Entomology
*Universidad Autónoma de Santo
Domingo*

Phillip Lobel
Associate of Ichthyology
Boston University

David Lohman
Associate of Entomology
The City College of New York

Vladimir A. Lukhtanov
Associate of Entomology
Russian Academy of Sciences

Duane McKenna
Associate of Entomology
University of Memphis

Russell Mittermeier
Associate of Herpetology
Conservation International

William Montevecchi
Associate of Ornithology
Memorial University of Newfoundland

Piotr Naskrecki
Associate of Entomology
Conservation International

Martin Nweeia
Associate of Mammalogy
Harvard School of Dental Medicine

Diane B. Paul
Associate of Population Genetics
Harvard University

David L. Pawson
Associate of Marine Biology
*Smithsonian National Museum of
Natural History*

Stewart Peck
Associate of Entomology
Carleton University

Paulo Petry
Associate of Ichthyology
The Nature Conservancy

Steve Poe
Associate of Herpetology
University of New Mexico

Michael Rex
Associate of Malacology
University of Massachusetts, Boston

Jury Rudyakov
Associate of Invertebrate Zoology
Commonwealth of Massachusetts

Jessica Rykken
Associate of Entomology
Harvard University

Chris Schneider
Associate of Herpetology
Boston University

Andrea Sequeira
Associate of Entomology
Wellesley College

Scott R. Shaw
Associate of Entomology
University of Wyoming

Joel Sohn
Associate of Ichthyology
Golden Mountain Trading Company

Stephen Tilley
Associate of Herpetology
Smith College

James Traniello
Associate of Entomology
Boston University

David Wagner
Associate of Entomology
University of Connecticut

David Wake
Associate of Herpetology
University of California, Berkeley

Marvilee Wake
Associate of Herpetology
University of California, Berkeley

Philip S. Ward
Associate of Entomology
University of California, Davis

Jacqueline Webb
Associate of Ichthyology
University of Rhode Island

R. Haven Wiley
Associate of Ornithology
University of North Carolina

Cheryl Wilga
Associate of Ichthyology
University of Rhode Island

Judith Winston
Associate of Marine Biology
Virginia Museum of Natural History

Staff

Emily Aker
*Curatorial Assistant, Collections
Operations*

Adam Baldinger
*Curatorial Associate, Invertebrate
Zoology, Malacology & Marine
Invertebrates*

Dorothy Barr
Public Services/MCB Liaison
Librarian, Ernst Mayr Library

Daniel Belich
*Reference Librarian, Ernst Mayr
Library*

Penny Benson
*Curatorial Assistant, Invertebrate
Zoology, Malacology & Marine
Invertebrates*

Constance Brichford
*Curatorial Assistant, Collections
Operations*

Ronnie Broadfoot
*Circulation/Reference, Ernst Mayr
Library*

Ian Butler
Curatorial Assistant, Entomology

Christopher Carden
*Cataloger, Biodiversity Heritage
Library*

Margaret Carayannopoulos
Financial Officer

Paul Chaikin
*Curatorial Assistant, Collections
Operations*

Flavia Chen
Curatorial Assistant, Ornithology

Judith Chupasko
Curatorial Associate, Mammalogy

Stefan Cover
Curatorial Assistant, Entomology

Jessica Cundiff
*Curatorial Associate, Invertebrate &
Vertebrate Paleontology*

Susan DeSanctis
*Serials Acquisitions Assistant,
Ernst Mayr Library*

Joseph DeVeer
*Head of Technical Services,
Ernst Mayr Library*

Samantha Edelheit
*Faculty/Collection Assistant,
Malacology; Editorial Assistant,
MCZ Publications*

Katherine Eldridge
Curatorial Assistant, Ornithology

Anne Everly
Research Assistant, Herpetology

Charles Farnum
Curatorial Assistant, Entomology

Helene Ferranti
*Faculty/Collection Assistant, Biological
Oceanography & Marine Biology*

Dana Fisher
*Assistant to the Librarian/Special
Collections, Ernst Mayr Library*

Jacqueline Ford
Library Assistant, Ernst Mayr Library

Linda S. Ford
Director, Collections Operations

Brendan Haley
*Senior Database Manager, Collections
Operations*

Karsten Hartel
Curatorial Associate, Ichthyology

Gwendolyn Fougy Henry
*Library Assistant and Archivist, Ernst
Mayr Library*

Kathleen Horton
*Faculty/Collection Assistant,
Entomology*

Amie Jones
*Faculty/Collection Assistant,
Entomology*

Maureen Kelly
IT Specialist, Biodiversity Informatics

Richard Knecht
*Collection Assistant, Invertebrate
Paleontology*

Petra Kubikova
*Faculty/Collection Assistant,
Entomology*

Laura Leibensperger
*Curatorial Assistant, Invertebrate
Zoology*

Jennifer Lenihan
*Curatorial Assistant, Invertebrate
Zoology*

Lisa Litchfield
Administrator, Concord Field Station

David Lowery
*Project Programmer, Biodiversity
Informatics*

Mara Lyons
*Faculty/Collection Assistant,
Invertebrate & Vertebrate Paleontology*

Joseph Martinez
Curatorial Assistant, Herpetology

Jessica McConnell
Collection Assistant, Ichthyology

Juri Miyamae
*Curatorial Assistant, Collections
Operations*

Richard Monk
*Database Programmer, Collections
Operations*

Paul Morris
*Biodiversity Informatics Manager,
Collections Operations*

Robert Morris
IT Specialist, Biodiversity Informatics

Katherine Mullen
Library Assistant, Ernst Mayr Library

April Mullins
*Acquisitions and Technology Specialist,
Ernst Mayr Library*

Catherine Musinsky
*Faculty/Collection Assistant,
Mammalogy*

John Nevins
*Laboratory Systems Manager for
Biological Oceanography & Marine
Biology*

Somer O'Brien
Staff Assistant, Concord Field Station

Mark Omura
Curatorial Assistant, Mammalogy

Philip Perkins
Curatorial Associate, Entomology

Alison Pirie
*Faculty/Collection Assistant,
Ornithology & Mammalogy*

Jignasha Rana
Research Assistant, Entomology

Murat Recevik
Curatorial Assistant, Malacology

Mark Renczkowski
*Curatorial Assistant, Invertebrate
Paleontology*

Constance Rinaldo
Librarian, Ernst Mayr Library

Alana Rivera
*Curatorial Assistant, Collections
Operations*

José Rosado
Curatorial Associate, Herpetology

Mary Sears
*Head of Public Services, Ernst Mayr
Library*

Diane Sheridan
*Faculty/Collection Assistant,
Invertebrate Zoology*

Margaret Starvish
Faculty/Collection Assistant, Ichthyology

Robert Stymeist
Curatorial Assistant, Ornithology

Christopher Sussman
Data Assistant, Collections Operations

Tsuyoshi Takahashi
*Curatorial Assistant, Herpetology &
Collections Operations*

Jennifer Thomson
*Faculty/Collection Assistant,
Populations Genetics*

Diana Tingley Turmenne
*Curatorial Assistant, Collections
Operations*

Jeremiah Trimble
Curatorial Associate, Ornithology

Tatiana De Souza Vargas
Data Assistant, Collections Operations

Zhimin Wang
IT Specialist, Biodiversity Informatics

Catherine Weisel
Museum Projects Coordinator

Ken Wilcox
*Building Superintendent, Concord Field
Station*

Victoria Wilke
Curatorial Assistant, Collections Operations

Andrew Williston
Curatorial Assistant, Ichthyology

Jonathan Woodward
*Curatorial Assistant, Herpetology &
Collections Operations*

Melissa Woolley
*Faculty/Collection Assistant,
Herpetology*

Robert Young
*Special Collections Librarian,
Ernst Mayr Library*

Breda Zimkus
Project Manager for Genetic Resources

Encyclopedia of Life, Learning + Education Group

Tracy Barbaro
Project Coordinator

Jeffrey T. Holmes
Digital Learning Editor

Marie M. Studer
Learning + Education Director

Administration for the Department of Organismic and Evolutionary Biology

Krista Carmichael
Senior Research Administrator

Rebecca Chetham
Director of Administration

Irv Dumay
Building Manager

Paul Dwyer
Mail Clerk

Jeannette Everitt
Administrative Coordinator

Jason Green
Financial Assistant

Stephanie Hillsgrove
Financial Assistant

Philip Norton
Building Services Coordinator

Christopher Preheim
Academic Programs Coordinator

Damari Rosado
Assistant Director of Administration

Anna Salvato
Manager of Financial Operations

Kristin Schubert
Senior Research Administrator

Deborah Smiley
Web Project Manager

Geoff Tierney
Senior Financial Officer

Laura Tomaino
Human Resources Coordinator

Angel Velarde
Financial Assistant

Ellen Wilkin
Financial Assistant

Harvard Student Staff, Interns & Temporary Staff

Julia Adams

Soumia Aitelhaj

Sarah Al-Naggar

Deborah Anderson

Laura Baldassarre

Victor Ban

Tiffany Bartz

Valerie Bradley

Lian Bruno

Kurt Burchfiel

Alanna Callendrello

Jasmine Casart

Lawrence Chan

Hayoung Chang

Ilsoo Cho

Donald Clarke

Carly Cohen

Sarah Cohen

Benjamin Cox

Margaret Crane

Ann Downer-Hazell

Marjorie Gullick

Alan Heath

Cynthia Herrick

Zachary Herring

Madeleine Higgins

Tamanna Hossin

Henry Huberty

Sarah Kariko

Alexander Krowiak

Olakunle Komolafe

Adam Lazarus

Jessica LeClair

Lauren Libby

Beryl Caroline Lipton

Patrick McCormack

Amy McCormick

Molly McDowell

Caroline McHugh

John Mewherter

Elaine Miller

Jessica Mitchell

Sarah Morris

Nadya Muchoney

Jessica Mullen

Kimberly O'Donnell

Valerie Root

Lisa Sanchez

Kaitlin Sheridan

Mariah Slone

Molly Solomon

Sharon Sticher

Elizabeth Storm

Laurel Varian

Gabriel Walker

Jelle Zijlstra

Tyler Zoanni

MCZ Faculty

The MCZ's charter, signed in 1859, mandates that the Museum's activities will be overseen by a governing board, the Faculty of the Museum of Comparative Zoology.

Dr. John D. Constable

Mr. Robert G. Goelet

Mr. George Putnam, Jr.

Mr. George Putnam, III

Dr. Barbara Jil Wu

Mr. Paul J. Zofnass

President Drew Gilpin Faust

Acknowledgements

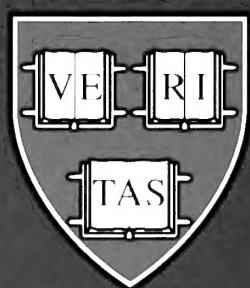
This annual report was produced by the Office of the Director of the Museum of Comparative Zoology.

Editors:

James Hanken, *Director*
Catherine Weisel, *Museum
Projects Coordinator*

Copy, Design & Production:

Cyndi Wood
Creative Project
Management, Inc.
www.creativeprojectmgmt.com



MUSEUM OF COMPARATIVE ZOOLOGY

26 Oxford Street
Cambridge, MA 02138

617.495.2460
www.mcz.harvard.edu